CQ

June 1971
$1.00

A Universal **Solid State** Preselector Converter. How to **Really** Read SSB Power Meters. Self contained S.W.R. Bridge with **Built-In** Signal Source.

na
CQ
ews
ring
Keyer.

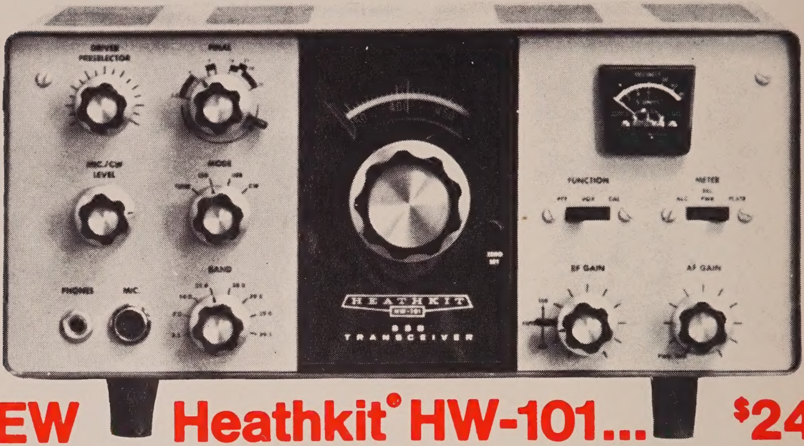
24 JUN

Radio Controlled Model Car Racing P.22

08240

The Radio Amateur's Journal

better than the "Hot-Water 100" ...and a nickel cheaper



NEW Heathkit® HW-101... $249.95*

World's best low cost rig is now even better. The Hams at Heath have done it again... by adding important new performance features to the famous HW-100... without adding to the price. That's Heathkit value... and this is the rig...

Improved receiver circuitry now delivers 0.35 uV sensitivity for 10 dB S+N/N.

Improved dial drive mechanism. New ball-bearing drive assembly provides a 36 to 1 knob to dial turning ratio... delivers 34 velvet-smooth knob revolutions per 500 kHz band segment.

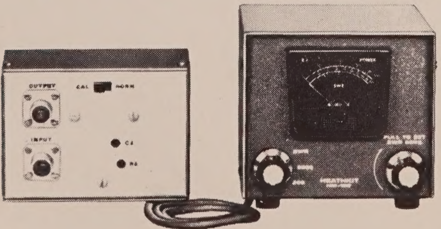
Front panel switch selection of SSB or CW filters. Now choose the built-in 2.1 kHz or optional 400 Hz filter with just a flip of a switch.

Plus all the features that made the "100" the world's most popular transceiver. Add it all up and you've got the new HW-101... a lot more rig for a little less money. From the Hams at Heath, of course.

Kit HW-101, 23 lbs.	**$249.95***
Kit HP-23A, AC supply, 19 lbs.	**$51.95***
Kit HP-13A, DC supply, 7 lbs.	**$69.95***
SBA-301-2, 400 Hz CW filter, 1 lb.	**$21.95***
SBA-100-1, mobile mount, 6 lbs.	**$14.95***

HW-101 SPECIFICATIONS — RECEIVER: Sensitivity: Less than 0.35 microvolt for 10 dB signal-plus-noise to noise ratio for SSB operation. **SSB selectivity:** 2.1 kHz minimum at 6 dB down; 7 kHz maximum at 60 dB down (3.395 MHz filter). **CW selectivity:** (with optional SBA-301-2 CW crystal filter installed); 400 Hz min. @ 6 dB down; 2.0 kHz max. @ 60 dB down. **Input:** Low impedance for unbalanced coaxial input. **Output impedance:** 8 ohm speaker, and high impedance headphone. **Power output:** 2 watts with less than 10% distortion. **Spurious response:** Image and IF rejection better than 50 dB. **TRANSMITTER: DC power input:** SSB, (A3J emission) 180 watt PEP (normal voice, continuous duty cycle). CW, (A1 emission) 170 watts (50% duty cycle). **RF power output:** 100 watts on 80 through 15 meters; 80 watts on 10 meters (50 ohm nonreactive load). **Output impedance:** 50 ohm to 75 ohm with less than 2:1 SWR. **Oscillator feed-through or mixer products:** 55 dB below rated output. **Harmonic radiation:** 45 dB below rated output. **Transmit-receive operation:** SSB: PTT or VOX. CW: Provided by operating VOX from a keyed tone, using grid-block keying. **CW side-tone:** Internally switched to speaker or headphone in CW mode. Approximately 1000 Hz tone. **Microphone input:** High impedance with a rating of –45 to –55 dB. **Carrier suppression:** 45 dB down from single-tone output. **Unwanted sideband suppression:** 45 dB down from single-tone output at 1000 Hz reference. **Third order distortion:** 30 dB down from two-tone output. **RF compression (TALC*):** 10 dB or greater at .1 mA final grid current. **GENERAL: Frequency coverage:** 3.5 to 4.0; 7.0 to 7.3; 14.0 to 14.5; 21.0 to 21.5; 28.0 to 28.5; 28.5 to 29.0; 29.0 to 29.5; 29.5 to 30.0 (megahertz). **Frequency stability:** Less than 100 hertz per hour after 30 minutes warmup from normal ambient conditions. Less than 100 Hz for ±10% line voltage variations. **Modes of operation:** Selectable upper or lower sideband (suppressed carrier) and CW. **Dial calibration:** 5 kHz. Calibration: 100 kHz crystal. **Audio frequency response:** 350 to 2450 Hz. **Transistors:** MPF105 FET–VFO; 2N3393–Voltage regulator. **Rear apron connections:** CW Key jack; 8 ohm output; ALC input; Power and accessory plug; RF output; Spare. **Power requirements:** 700 to 850 volts at 250 mA with 1% maximum ripple; 300 volts at 150 mA with .05% maximum ripple; –115 volts at 10 mA with .5% maximum ripple; 12 volts AC/DC at 4.76 amps. **Cabinet dimensions:** 14 13/16" W x 6 5/16" H x 13 3/8" D.

*Triple Action Level Control™



New Heathkit® Wattmeter... $29.95*

You asked for it... a low cost high quality Heathkit wattmeter. New HM-102 measures RF power output from 10-200 W and 100-2000 W in two switch-selected ranges. Built-in calibrator permits 10% accuracy throughout the 80-10 M bands. Built-in SWR capability. Negligible loss permits permanent insertion in any 50 ohm line. Exclusive remote detector allows placement of meter in any location. Put the new HM-102 in your shack now... it's another powerful value from the Hams at Heath.

Kit HM-102, 3 lbs.	**$29.95***

The only difference between the new Heathkit® Frequency Counter and those costing $400

...is the price $199.95*

1 4 5 7 0.
HZ
HEATHKIT
FREQUENCY COUNTER
OFF
ON
KHZ
HZ
INPUT

Compare performance & features of the IB-101 to counters selling for twice the price! Counts from 1 Hz to over 15 MHz; advanced IC design eliminates blinking readout and divider chain adjustment.

8-digit capability. Set the range switch to kHz and read to the nearest kHz . . . push the range switch to Hz and read down to the last Hz. Overrange & Hz/kHz indicators light up to give correct range at all times; do an 8-digit measurement with 5-digit readout.

Exclusive Heath-designed input circuit. Dual gate, diode-protected MOSFET design provides proper triggering without adjustment from less than 100 mV to over 200 V. Input Z is 1 megohm shunted by less than 20 pF to minimize circuit loading & error.

Other features include sockets for all 26 IC's and 5 display tubes . . . double-sided, plated-thru fiberglass circuit board . . . 120/240 VAC operation . . . convenient handle/tilt-stand. Compare the new Heathkit IB-101 to the $400 models . . . and discover that $199.95 buys more counter.

Kit IB-101, 7 lbs. **$199.95***

IB-101 SPECIFICATIONS: Frequency Range: 1 Hz to greater than 15 MHz. **Accuracy:** ±1 count ± time base stability. **Gate Times:** 1 millisecond or 1 second with automatic reset. **INPUT CHARACTERISTICS – Sensitivity:** 1 Hz to 1 MHz, less than 100 mV rms. 1 MHz to 15 MHz, less than 250 mV rms, after 30 minutes warmup. **Trigger Level:** Automatic. **Impedance:** 1 Megohm shunted by less than 20 pF. **Maximum Input:** 200 V rms. DC – 1 kHz. Derate at 48 V per frequency decade. **TIME BASE: Frequency:** 1 MHz, crystal controlled. **Aging Rate:** Less than 1 PPM/month after 30 days. **Temperature:** Less than ±2 parts in 10^7/degree C. 20 to 35 degrees C after 30 minutes warmup. ±.002% from 0 to 40 degrees C. **GENERAL: Readout:** 5 digits plus overrange ambient. **Temperature Range:** Storage; –55 to 80 degrees C. Operating; 0 to 40 degrees C. **Power Requirements:** 105-125 or 210-250 VAC, 50/60 Hz, 8 watts. **Cabinet Dimensions:** 8¼" W x 3⅛" H x 9" D not including handle. **Net Weight:** 4½ lbs.

FREE '71 CATALOG

Describes these and over 300 other Heathkits. Save up to 50% by building them yourself. Use coupon and send for your FREE copy!

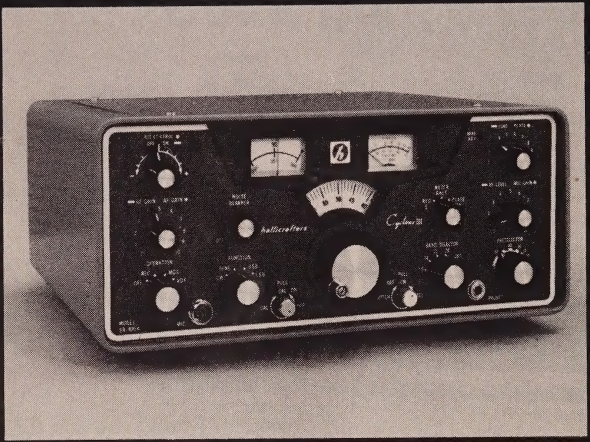
HEATHKIT®
a Schlumberger company

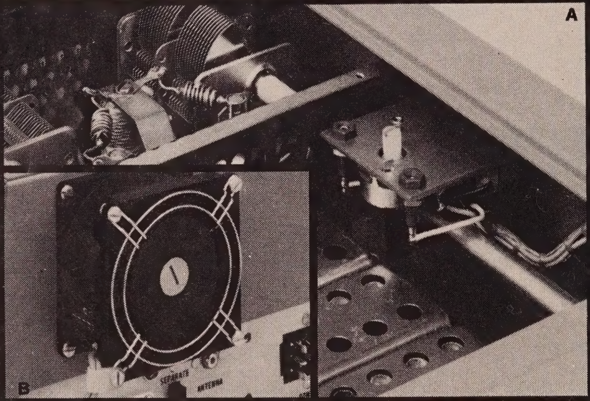
HEATH COMPANY, Dept 12-6
Benton Harbor, Michigan 49022

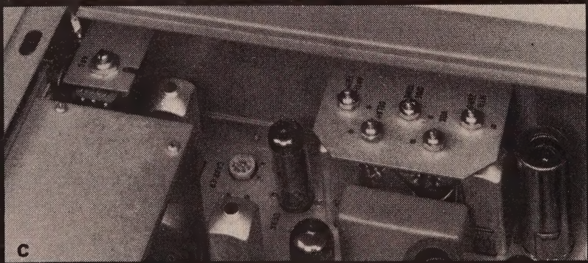
☐ Enclosed is $________________, plus shipping.
Please send model (s) ________________
☐ Please send FREE Heathkit Catalog.
Name ________________
(Please Print)
Address ________________
City ________ State ________ Zip ________

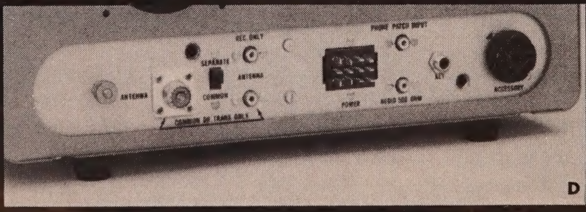
Prices & specifications subject to change without notice.
*Mail order prices; F.O.B. factory.
TE-233R

HALLICRAFTERS' NEW SR-400A HAS INCREASED POWER TO 550 WATTS P.E.P. WITH IMPROVED RELIABILITY FOR CONTINUOUS DUTY OPERATION.


hallicrafters
Cyclone III


A
B
SEPARATE
ANTENNA




ANTENNA
SEPARATE
COMMON
REC. ONLY
ANTENNA
COMMON OR TRANS ONLY
PHONE PATCH INPUT
POWER
AUDIO 500 OHM
ACCESSORY
D

The incomparable new CYCLONE III features:

A. Increased SSB input and output power with Hallicrafters' engineered exclusive Power Amplifier tube balancing adjustment. It provides matching and peaking of tube gain for continuous, maximum power output.

B. Improved reliability through optional HA-60 heavy duty, high efficiency cooling fan (6.4 CFM rated) for Power Amplifier. Permits continuous duty operation in either SSB or CW modes at high power levels with greater reliability.

C. Easily accessible internal adjustment panels include AGC attack, Carrier balance. (3) VOX controls, S-Meter adjust and CW side tone volume for interface with various types of microphones, tube aging and general performance adjustments.

D. Rear panel input/output terminals and connectors for phone patch, accessories, power supply, antenna plus provision for common or separate receiving and transmit antennas, or linear amplifier operation.

Of course, the new Hallicrafters SR-400A also has semi break-in CW, RIT, AALC, VOX, USB/LSB, < 1 KHz readout, noise blanker plus many more exclusive features.

Ask for it at your local Hallicrafters' distributor.

hallicrafters

600 Hicks Road
Rolling Meadows, Illinois 60008
A Subsidiary of Northrop Corporation.

CQ

JUNE, 1971 VOL. 27, NO. 6

The Radio Amateur's Journal

STAFF

EDITORIAL

RICHARD A. ROSS, K2MGA
Editor
ALAN M. DORHOFFER, K2EEK
Managing Editor
IRVING TEPPER, WB2FUZ
Technical Editor
WILFRED M. SCHERER, W2AEF
Technical Director
JOAN WEILBACHER
Editorial Assistant

CONTRIBUTING

FRANK ANZALONE, W1WY
Contest Calendar
GEORGE JACOBS, W3ASK
Propagation
BYRON H. KRETZMAN, W2JTP
RTTY Consultant
A. EDWARD HOPPER, W2GT
USA-CA
JOHN A. ATTAWAY, K4IIF
DX
GORDON ELIOT WHITE
Surplus Sidelights
ALLEN KATZ, K2UYH
VHF Today

BUSINESS

SANFORD R. COWAN
President
RICHARD A. COWAN, WA2LRO
Publisher
JACK N. SCHNEIDER, WA2FPE
Advertising Director
HAROLD WEISNER, WA2OBR
Circulation Director
GLORIA FORSYTH
Circulation Manager

PRODUCTION

WILLIAM H. TRAVIS
Art Director
DAVID R. LANCE
Staff Artist

TABLE OF CONTENTS

RADIO CONTROL MODEL CAR RACING
Howard G. McEntee, W2SI 22

SSB POWER METERS: HOW TO READ THEM
Douglas H. Horner, W0HUF 30

NEW AMATEUR PRODUCTS.. 32

F.M.: REPEATER PROPOSAL; ENCODER REVIEW............ 35

LATE AMATEUR SATELLITE NEWS
George Jacobs, W3ASK 41

BROADBAND ANTENNA FOR FORTY METERS
Howard Phillips, WB5ACP 43

FURTHER IMPROVEMENTS OF THE HAM-M ROTATOR INDICATOR
Stuart Meyer, W2GHK/4 46

A UNIVERSAL SOLID STATE PRESELECTOR/CONVERTER FOR THE SW BANDS
Jack Perolo, PY2PE1C 49

CQ REVIEWS: THE PICKERING MODEL KB-1 ELECTRONIC KEYER
Wilfred M. Scherer, W2AEF 56

F.M.: HOW TO SPEAK IT *Glen E. Zook, K9STH/5* 61

AN S.W.R. BRIDGE WITH A BUILT-IN 80 THROUGH 10 METER SIGNAL SOURCE
Timothy P. Hulick, W9MIJ/4 64

DEPARTMENTS

ANNOUNCEMENTS 8
CONTEST CALENDAR .. 78
DX 71
OUR READERS SAY 7
PROPAGATION 75
Q & A 80
SURPLUS SIDELIGHTS .. 85
USA-CA 82
ZERO BIAS 5

Offices: 14 Vanderventer Avenue, Port Washington, L.I., N.Y. 11050. Telephone: 516-883-6200.

CQ (Title registered U.S. Post Office) is published monthly by Cowan Publishing Corp. Second Class postage paid at Port Washington and Miami, Florida. Subscription Prices: one year, $6.00; two years, $11.00; three years, $15.00. Entire contents copyrighted 1971 by Cowan Publishing Corp. CQ does not assume responsibility for unsolicited manuscripts. Allow six weeks for change of address. Printed in the United States of America.

Postmaster: Please send form 3579 to CQ Magazine, 14 Vanderventer Ave., Port Washington, L.I., N.Y. 11050

STEP UP TO TELREX

Professionally Engineered Antenna Systems

Single transmission line "TRI-BAND® ARRAY"

By the only test that means anything . . . on the air comparison . . . this array continues to outperform all competition . . . and has for two decades. Here's why . . . Telrex uses a unique trap design employing 20 HiQ 7500V ceramic condensers per antenna. Telrex uses 3 optimum-spaced, optimum-tuned reflectors to provide maximum gain and true F/B Tri-band performance.

ONLY TELREX GIVES YOU ALL THESE FEATURES . . .

- Power rating 4 KW PEP . . . rain or shine
- Wind rating survival 110 MPH
- Patented broad-band coaxial Balun
- Heavy-duty steel gusset mounting plate
- Aluminum boom 2 in., 2½ in. O.D. x 18 ft.
- Large diameter, .058 wall taper-swaged dural elements for minimum weight and exceptional strength to weight ratio
- Stainless steel electrical hardware

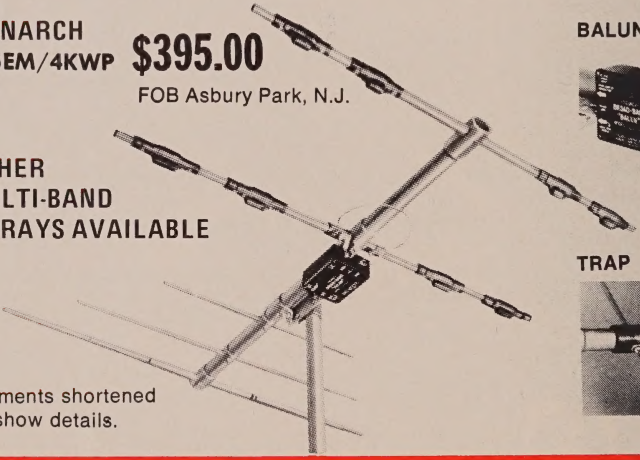
With a Telrex Tri-band Array you get 49 lbs. of educated aluminum engineered and built to provide many, many years of performance unmatched around the world by any other make. Longest element 36 ft. Turning radius 20 ft. Shipping weight 65 lbs. Shipping container 13 in. x 5 in. x 13 ft.

Note: If not available from your dealer, order direct. You'll get fast, personal service.

Telrex Labs are design engineers, innovators and manufacturers of the world's finest ¾ to 160 meter communication systems and accessories priced from $25 to $25,000.

For technical data and prices on complete Telrex line, write for Catalog PL 70.

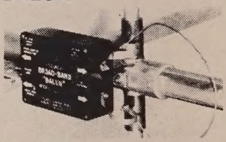
MONARCH
TB5EM/4KWP **$395.00**
FOB Asbury Park, N.J.



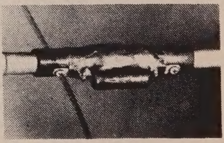
OTHER MULTI-BAND ARRAYS AVAILABLE

Elements shortened to show details.

BALUN



TRAP



TYPICAL TELREX MONOBAND ANTENNAS

Mod. 15M317-	15 mtr. 3 el. rotary, 10 DB gain, 4 KWP pow. rat., 2½" O.D. x 17' boom	$175.00
Mod. 20M326-	20 mtr. 3 el. rotary, 10 DB gain, 8 KWP pow. rat., 3½" O.D. x 26' boom	355.00
Mod. 2M609-	2 mtr. 6 el. array, 14 DB gain, 300 W pow. rat., 1" x 9' boom	39.95
Mod. 2M814C-	2 mtr. 8 el. array, 16.5 DB gain, 300 W pow. rat., 1.375" x 14' boom	59.00
Mod. 6M516-	6 mtr. 5 el. array, 13 DB gain, 400 W pow. rat., 1.5" x 16' boom	63.95

Communications and TV Antennas
SINCE 1921 **Telrex** **LABORATORIES**
Asbury Park, New Jersey 07712 201-775-7252

OUR READERS SAY

CB on 220 mc

Editor, *CQ:*

I have remained silent during all the recent controversy surrounding amateur radio. The letter from David P. Smith in March *CQ* encourages me to cease my silence:

It is quite true that one need not know how to overhaul an automobile to drive. It is just as true that one need not know how to overhaul a radio transmitter to obtain a valid amateur license. Look around you, Mr. Smith!

I do not believe that amateurs are selfish as a group. In fact, it is my experience that they encourage and assist those who aspire to join the ranks.

CB is not our (radio amateurs) problem. It belongs to the FCC. Why don't we worry about things we can control? There is evidence of poor operation by licensed amateurs on amateur bands. Until our house is clean, let's stay home!

Bootlegging in our bands is our problem. Here we should help the FCC to identify the culprits at which time it becomes their problem.

Like it or not, incentive licensing is here to stay. Why upgrade one aspect while adding an obviously downgraded segment to our ranks?

Like it or not, c.w. is here to stay.

Amateurs, for the most part, try to be fair. They are not selfish. They simply do not believe in the use of radio spectrum by individuals who are too lazy to learn code and theory. And why should they? After all, each of them knows that it can be done and most of them recognize the value of such requirements.

Charles A. Schuler, WA3MDH
Rosco, PA

Editor, *CQ:*

I read with interest the letter "CB on 220 mc" from David P. Smith, K9UIM of Olney, Ill. This letter, which you printed in your March 1971 editor quite caught my interest.

As a CB operator of long standing—and as an aspiring Ham operator, I applaud Mr. Smith's reasonable and reasoning attitude. I agree 100% that CB radio has been ruined by persons who abuse and misuse the service provided them. An "exchange" such as it suggested by Mr. Smith might be of substantial benefit to both Citizen's Band operators and to amateur operators.

However, the point that really caught my eye was the reasonable attitude taken by Mr. Smith towards users of an other radio service. Regardless of whether or not you or I believe that the users of the Citizens Radio Service *deserve* the use of that service or not is immaterial. The fact that I personally am somewhat fed up with the "air garbage" that I have to put up with on the 27 megs range has nothing to do with it. The only thing that does matter is that this separate radio service—the Citizens Band range—exists, and that there are some good people who are interested in using their radios to promote the public welfare; there are some good people using CB Radio who are interested in promoting proper use of their transceivers—who are interested in good radio procedures. I am sure that it is about these people and to these people that Mr. Smith directed his letter. I applaud his action and second it. I commend him for his reasonable—and reasoning attitude. Nuff sed.

Clarence S. Wright, Jr., KCJ-7619
Norfolk, VA

Editor, *CQ:*

I cannot accept the reasoning of D. P. Smith relative to opening the 220 mc band to those too lazy to study for a ham license. If they wish to operate on our bands, let them study and take the examination like we had to do. This suggestion makes about as much sense as presenting anyone with a ticket to operate amateur radio equipment regardless of his qualifications. I notice he did not suggest eliminating the lower class of amateur tickets and make all amateurs equal and with equal privileges on all bands and do away with the restricted sections for those with Extra class tickets. We worked hard in order to get a license so let them do likewise if they are not too damned lazy. I have been conducting a class in code and theory in my office each Saturday ince November '69 and some of my students hold CB licenses. We are watching for illegal CB operators and will report them to the FCC.

The CB gang put a foot in the door by taking over one amateur band and we should not let them take over the rest. We owe them nothing and we worked hard for what we now have. I guess Dave would also let the demonstrators burn and loot so they can enjoy themselves. We have made amateur radio what it is today and let's keep it that way.

A. Edward Terpening, W4VCY
Tarpon Springs, FL

Editor, *CQ:*

I read with interest the letter from K9UIM giving his thoughts on moving CB activities to the 220 mc ham band.

I agree with him completely, but for a different reason.

Most illegal CB operations are conducted by persons who would like to be radio amateurs, but who do not care to spend a little time with books learning the simple theory required for the lowest class amateur license. They therefore go to the CB bands and conduct amateur type operations in violation of the CB rules and regulations. These people are interested in working DX, getting QSL cards, using power amplifiers, putting up unauthorized antenna types at unauthorized heights and even using profane language and unauthorized types of emmissions.

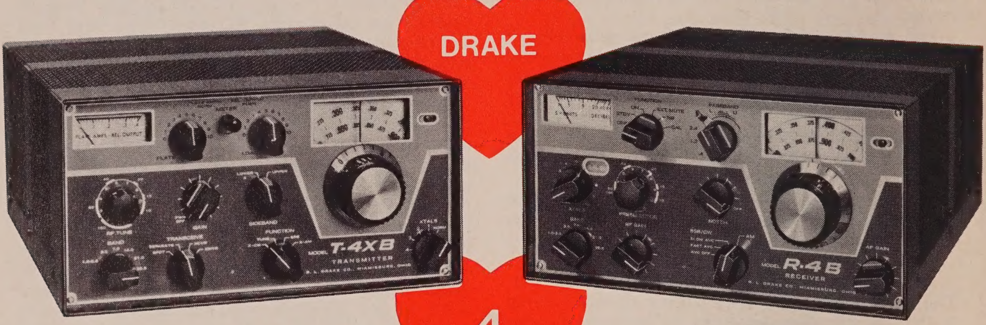
A rebuttal will surely be that some hams do some of the same illegal things. True, a very minor number of hams do not follow the rules, but at least they know better.

Separately they're great!

R. L. Drake quality-built R-4B Receiver is versatile, accurate, dependable, as is the Drake T-4XB Transmitter. They stand on their own merits used independently, but . . .

TOGETHER they're incomparable!

Ideal for transceiving, 160 and MARS



4
LINE

T-4XB
TRANSMITTER

• **Covers ham bands** 80, 40, 20, 15 meters completely and 28.5 to 29.0 Mc of 10 meters with crystals furnished; MARS and other frequencies with accessory crystals, except 2.3-3, 5-6, 10.5-12 Mc. • **Upper and Lower Sideband** on all frequencies • **Automatic Transmit Receive Switching on CW** (semi break-in) • **Controlled Carrier Modulation for AM** is completely compatible with SSB linear amplifiers • **VOX or PTT** on SSB and AM built-in • **Adjustable Pi-Network Output** • **Two 8-pole Crystal-Lattice Filters** for sideband selection, 2.4 kc bandwidth • **Transmitting AGC** prevents flat topping • **Shaped Grid Block Keying** with side tone output • **200 Watts PEP Input on SSB**— 200 watts input CW • **Meter indicates plate current and relative output** • **Compact size; rugged construction** • **Solid State Permeability Tuned VFO** with 1 kc divisions • **Solid State HF Crystal Oscillator** • **11 Tubes, 3 Transistors and 12 diodes** • **Dimensions:** 5½"H, 10¾"W, 12¼"D. **Wt.:** 14 lbs. **$495.00** Amateur Net.

R-4B
RECEIVER

• **Linear permeability tuned VFO** with 1 kc dial divisions. VFO and crystal frequencies pre-mixed for all-band stability • **Covers ham bands** 80, 40, 20, 15 meters completely and 28.5 to 29.0 Mc of 10 meters with crystals furnished • **Any ten 500 kc ranges between 1.5 and 30 Mc** can be covered with accessory crystals for 160 meters, MARS, etc. (5.0-6.0 Mc not recommended) • **Four bandwidths of selectivity,** 0.4 kc, 1.2 kc, 2.4 kc and 4.8 kc • **Passband tuning** gives sideband selection, without retuning • **Noise blanker that works on CW, SSB, and AM** is built-in • **Notch filter and 25 Kc crystal calibrator** are built-in • **Product detector** for SSB/CW, **diode detector** for AM • **Crystal Lattice Filter** gives superior cross modulation and overload characteristics • **Solid State Permeability Tuned VFO** • 10 tubes, 10 transistors, 17 diodes and 2 integrated circuits • **AVC** for SSB or high-speed break-in CW • **Excellent Overload and Cross Modulation characteristics** • **Dimensions:** 5½"H, 10¾"W, 12¼"D. **Wt.:** 16 lbs. **$475.00** Amateur Net.

$495.00 + $475.00

Togetherness... it's wonderful!

Get together with your distributor,
or write for free brochure . . .

R. L. DRAKE COMPANY **540 Richard Street, Miamisburg, Ohio 45342**

Since many CBers are desirous of ham-type DX operations, shifting the CB band to 220 mc will prevent any real DX contacts for these types and in my opinion not too long after a shift to v.h.f., CB illegal operations will gradulally cease as the want-to-be-ham types gradually fade away into history.

Therefore, I am wholeheartedly in favor of any plan to shift CB operations to v.h.f. We may lose a band, but I think we would get it back after a few years.

R. F. Herbig, W6ME
Oceanside, CA

Editor, *CQ:*

Few would deny that the greatest deterent to the hindrance of the growth of ham radio (a subject dear to our hearts) has been CB since the late 50's. Also, few would deny that a large number of CBers, if indeed not a majority, participate in the "DX" to be found on 11 meters.

I feel that these DX'ers are on CB because it is the easiest road to long distance radio communications. Now someone has come up with a proposal to eliminate that path. The proposal is to move CB to 220 mc. At that frequency the cross continent contacts would be rare indeed.

These budding DX'ers would now turn to ham radio. This would have two benefits: 1) ham population would increase rapidly, 2) the legitimate CB'ers would have reliable short distance communications.

We would stand to lose part or all of one of our v.h.f. bands. We would stand to gain many new friends and, just possibly, a new lease on life for our hobby.

Jonathan Bloom, WA3JSV
Gettysburg, PA

Some Day He'll Get His

Editor, *CQ:*

I just picked up the March issue of *CQ* and found a friend on page 12 under the heading, From The Publisher. The only way to describe this article is outstanding!

As a police officer I often hear the story, "Oh, someday he'll get his, but as for me, I don't want to get mixed up in it..." That's why it is so refreshing to hear someone as yourself speak out against those taking sincere hams.

I enjoyed the article so much, you will find my personal check enclosed in the amount of $6.00 for a one year subscription to *CQ* Mag.

Thank you again and keep those presses rolling.

William D. Bowen, WB9EDJ
Indianapolis, IN

Super Power Solution?

Editor, *CQ:*

I wish to express my wholehearted approval of the recent FCC proposal to expand the phone bands and to allocate more frequencies to the Extra class licensee.

I would also like to express my desire to see a reduction in the power limit for amateur transmitters. This would have to be in the form of a rule requiring a limitation on the total amplifier plate dissipation. The rules concerning d.c. power input are totally disregarded by many amateurs who run up to 10 kw or more input to multiple 4-1000-A's.

There is no adequate means of policing the present rule, especially when s.s.b. is used. If an amateur's transmitter were limited to a total plate dissipation capability of 500-1000 watts with a mandatory license suspension for anyone with a larger transmitter in their possession, whether in use or not, it would be a great deal easier to enforce the rules.

Melvin G. Hart, W0IBZ
St. Louis, MO

Poor People's Radio

Editor,*CQ:*

On November 19, 1970 our organization, which is known as Poor Peoples' Radio, Inc. (really, hi!) was granted a construction permit by the FCC for a non-commercial f.m. broadcast station. We will serve San Francisco. The chief engineer is a ham and holds a First Phone ticket since 1951.

Our call sign is KFPR. We are not yet on the air, but must be on the air by November or lose our CP.

Perhaps some of your readers would be interested in our groovy little operation and would want to help. My landline at home is (415) 751-1974.

I read your magazine every month, along with the others (hi) and enjoy it.

Meyer Gottesman, W6GIV
San Francisco, CA

Objects to Contests

Editor, *CQ:*

I am writing to voice objection to the number of "tests" which, over the past few years, have increased to an unbelievable frequency.

My primary operating time occurs on weekends and this is probably true of most hams. It is really frustrating to look forward to hamming over a weekend, only to find a contest going on. The "Testers" appear to feel that theirs is a priority right to all frequencies on all bands. Their lack of consideration and complete domination of the bands makes carrying on a QSO all but impossible.

I am puzzled by the purpose served in most contests. If I call "Q-R-ZED TEST" and someone gives me a 5/9-200, what have I learned, what has he learned, what have we accomplished toward upgrading the "state of the art," how have we furthered relations between two countries, or for that matter, between two individuals?

Today is March 16th. I'm listening to another contest. Once again I'm having to confine my activities to c.w. I don't mind c.w., matter of fact, most of my on-the-air time is c.w., but it is a little difficult to run a phone patch in c.w., etc. I have a FB phone rig but it hardly gets used in that manner anymore!

Please—some effort toward holding contests on specified sections of the band rather than the entire band. Ha! I hear a KZ5 calling "CQ NO CONTEST." Maybe that is the answer.

Hal Pottorf
Topeka, KS

Designed for Application

The No. 90651-A

GRID DIP METER

Now with transistor d.c. amplifier to increase sensitivity. Full scale meter reading at all frequencies 1.7 to 300 mc. Taut band meter. These additions made while maintaining all of the features which have made the MILLEN Grid Dip Meter so thoroughly reliable. Same stable oscillator without spurious dips. Transformer-type power supply. The standard 90651 will continue to be available also.

JAMES MILLEN
MFG. CO., INC.

MAIN OFFICE AND FACTORY
MALDEN
MASSACHUSETTS

Announcements

Attention County Hunters & WPXers

KC0KC has been authorized by the FCC for use July 1st through July 5th, by the Independent County Hunters at their big convention in Kansas City, Missouri. They will be on 14336 kc and other frequencies; QSL to WA0WOB.

Corrections

The following errors crept into the February issue: "An Introduction To VHF FM", page 21, fig. 4, the emitter bypass capacitor for Q_2 should have its polarity reversed. Page 22, Fig. 5, Q_{10} should be a power transistor in order to carry the total current in lieu of a filter choke. The tuning meter should read in microamperes instead of ma as shown.

In the April issue, on page 100 ("A Single Boom G4ZU Beam"), the 20 meter trombone resonance should be 14.5 mc and not 13.5 mc as indicated.

Florida Motoring

Any amateur driving down Highway 19 on the west coast of Florida can contact a number of stations on 50.40 mc. Many stations, including W4VCY, W4RDP, WB4TGW, WB4CBV monitor 50.40 every day and all day.

American Novice Net

The ANN informs us that meeting times and frequencies for the various regional divisions may be found by contacting WN7ONC, ANN Founder, at P.O. Box 170, Hebo, Oregon. The net's operating procedures are outlined in the net paper *The Novice*. WN7ONC can supply details on that, too.

Stolen Equipment

On Feb. 19, 1971, the home of John A. Hultquist Jr., K6GSS, was broken into and the following equipment was stolen. Drake R4B receiver (#9733C), Heathkit SB-400, Heathkit HX-30, National NC-240D, EICO 425 oscilloscope. There are numerous identifying marks which John can supply. This equipment was stolen in the Sunnyvale California area. Anyone having any information on this equipment can contact John at 660 Timberpine St., Sunnyvale, California 94086.

Sacramento Valley, California

The Sacramento Valley annual get-together will be held on Sunday May 15, 1971 at Carmichael Park. It is a joint presentation of the North Hills ARC, Sacramento ARC and the RAMS. Prizes, refreshments and special events are planned, along with commercial exhibits. Oliver Swan

The Yaesu FTdx 560 Transceiver. 560 watts PEP SSB. 500 watts CW. $450 complete. All you add is mike, speaker and antenna.

Incredible.

At $450 the Yaesu FTdx 560 is an incredible buy. It would be impossible if it weren't for a couple of facts. One, the Yaesu is made in Japan; two, it's sold direct to you—eliminating the big dealer's profit.

These days, when you think of Japanese-built products, think of Nikon, or Sony, or Toyota. And Yaesu. Our transceivers are state-of-the-art engineered and carefully hand-assembled. They're so solid, stable and reliable we guarantee them for one year. Yaesu is quite likely the best transceiver made anywhere in the world today.

The complete Yaesu story is a long one. So we've compiled a comprehensive information packet that gives you the complete picture. Including things like comparative detail photos, a schematic, and a comparison chart that shows you the FTdx 560's superiority over rigs you're more familiar with. Once you've looked over the FTdx 560 literature we think you'll agree that the amateur operator's impossible dream has become an incredible fact.

SPECTRONICS WEST
1491 E. 28th, Signal Hill, Ca. 90806 / Phone: (213) 426-2593

SPECTRONICS EAST
Box 1457, Stow, Ohio 4424 / Telephone: (216) 923-4567

☐ Please send new color catalog of all Yaesu products.

☐ Enclosed find $__________

Please send model(s) __________

Name__________

Address__________

City__________State__________Zip__________

All prices F.O.B. Signal Hill, Ca.

THE TALL ONE

Tri-Ex Sky Needle Tower

The slim, sophisticated free-standing tower. Telescoping, tubular steel design. Hinged base mount.

A selection between hand-cranked or electrically operated models.

Write today for free brochure. Many models available.

MODEL	HEIGHT EXTENDED	NESTED
TM-240	40'	22'
TM-358	58'	22½'
TM-370/ 370HD	70'	27'
TM-490	90'	28'
TM-5100R	100'	29'

Tri-Ex® TOWER CORPORATION
7182 Rasmussen Avenue
Visalia, California 93277

and "Doc" Gmelin are guest speakers. For further details write to Art Hartwell, 2630 El Segundo Dr., Rancho Cordova, California 95670 or call 916-363-9225.

Rochester, New York

Rochester is the location for the 38th annual Western New York Hamfest and VHF Conference on Saturday, May 15th. The new location is the Monroe County Fairgrounds, Rte. 15A, just north and east of N.Y. Thruway exit 46. Numerous activities are planned along with a huge flea market. Advance registration and banquet, $6.75. Registration alone is $2.75. For tickets and information write to Western N.Y. Hamfest, Box 1388, Rochester, N.Y. 14603.

1971 Armed Forces Day Communication Tests

On May 15, several military radio stations will participate in communication tests which include military-to-amateur crossband operations and receiving contests. Special QSL cards will be forwarded to those amateurs who establish two-way contact with participating military stations. For a complete list of operating frequencies contact Chief J. F. Fagan, Jr., U.S. Navy Marine MARS, 4401 Massachussets Ave., Washington D.C. 20390.

Washington DC.

The U.S. Navy will provide an amateur radio station, K4NAA, operating daily from the Sheraton Park Hotel during the three days of the Armed Forces Communication and Electronics Association Convention in June. The K4NAA fixed portable station will be operational from 0900 to 2200 E.D.S.T. from June 8-10. It will have two positions for c.w. and s.s.b. from 10 through 80 meters.

Dixon, Illinois

The fifth Rock River Hamvention will be presented by the Rock River R.C. of Dixon, ill. on May 16 from 9:00 A.M. to 5 P.M. at the Lee County 4-H Center, Amboy Ill. which is located one half mile east of the intersection of Highway 52 and 30. Advance tickets are $1.50 and $2.00 at the door. For tickets and further information, contact, Carl Karlson, W9ECF, Nachusa, Ill. 61057.

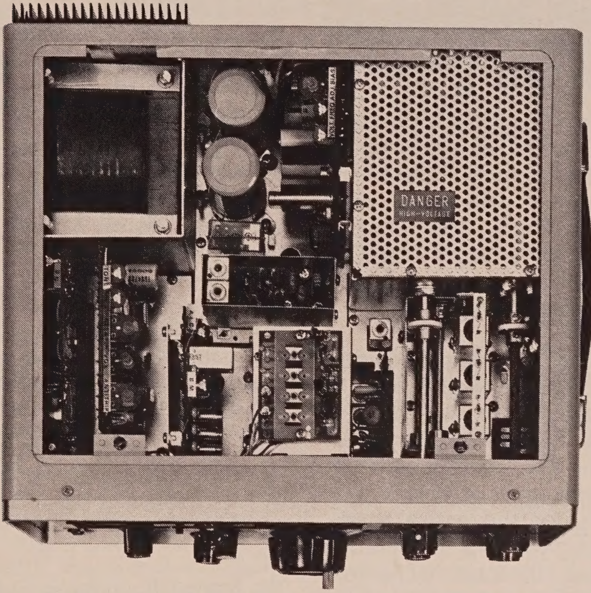
Hazel Park, Michigan

The Hazel Park ARC will hold their 5th annual Swap & Shop on Sunday May 16 at Hazel Park High School. Free parking for 1000 cars. Door prizes, snack bar and other activities are planned. Entrance donation is $.50. For complete details contact James E. Turner, WA8UQP, 1760 E. Harry, Hazel Park, Michigan 48030.

Malden, Mass.

The Malden Amateur Radio Association once again is sponsoring an auction. It will be held

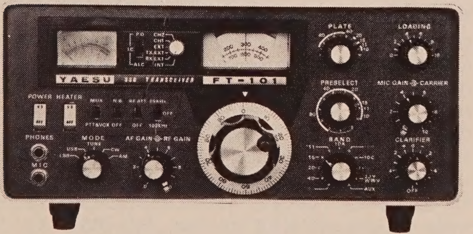
The reason the Yaesu FT-101 is the world's best portable rig is really an inside story.



Mill-spec gear? That's the way it looks. And that's the way it works. It's the solid-state FT-101 portable Yaesu.

Except for the final tubes, the FT-101 uses 10 FET's, 3 IC's, 31 silicon transistors and 38 silicon diodes. And most of them are found on plug-in computer-type modules. Modules that you mail to us for factory-new replacements, should they ever give you trouble. And the whole rig is guaranteed for one year.

But ruggedness is only a footnote to the FT-101 story. The real story is found in features. Features like a built-in VOX, 25 KHz and 100 KHz calibrators, the WWV 10 MHz band, a high Q permeability tuned RF stage and a ±5 KHz clarifier. That means home-base type operation, whether you're cruising near Pawtucket or working portable somewhere on the outskirts of Pago-Pago.



It's all in a thirty-pound package that even includes built-in 12 VDC and 117 VAC power supplies. You supply the 12 or 117 volts plus an antenna and you're ready to work the world — on the 80 meter band right through 10 meters. And you'll work it with 260 W PEP, 180 W CW or 80 W AM maximum input power. Receiving sensitivity is 0.3 microvolts for a 10 db signal-to-noise ratio.

For in-car operation, there's a built-in noise blanker. It picks out noise spikes and leaves clean signal copy behind.

Another important part of the FT-101 story is the price: only $499.95.

SPECTRONICS WEST

1491 E. 28th, Signal Hill, Ca. 90806 / Phone: (213) 426-2593

SPECTRONICS EAST

Box 1457, Stow, Ohio 4424 / Telephone: (216) 923-4567

☐ Please send new color catalog of all Yaesu products.

☐ Enclosed find $__________

Please send model(s) __________

Name__________

Address__________

City__________State__________Zip__________

All prices F.O.B. Signal Hill, Ca.

NEW Mobile Antenna System

VSWR GUARANTEE of *1.5/1* or better

Celebrating Our 25th Year! Mosley Electronics, Inc. takes pride in introducing an Anniversary-Special . . . The new "Rode-Master", featuring a GUARANTEE of an adjustable VSWR of 1.5/1 or better at any given frequency on each band.

Designed for the economy-Minded Ham, the new "Rode-Master" offers a choice of 6. 10, 15, 20, 40, 75 &/or 80 meters. The upper telescoping Whip section doubles as a 6-meter antenna completely adjustable for the entire band. You select from five new precision wound 400 Watt Coils for 10, 15, 20, 40 and 75/80 meter operation.

Other Special Features:

Bumper or trunk mounting option . . . Guying device for frequency stability at highway speeds . . . Break-over (hinge) to lower antenna . . . Rotate antenna 360° in the break-over position. A convenience for easy coil insertion, whip adjustments etc. . . . DX Matching Network: Small, simple to install and operate. The real reason why Mosley can Guarantee an adjustable VSWR of 1.5/1 or better.

Free QSO Index with the purchase of a complete "Rode-Master" antenna system. Get all the facts, See your Mosley dealer or write Dept. 206.

Mosley Electronics Inc

4610 N. LINDBERGH BLVD., BRIDGETON MO. 63044

on May 22 at the American Legion Hall on Pleasant St. in Malden. The auction starts at 8 P.M. with the association getting 10% of the sale.

Lake Delton, Wisconsin

The Yellow Thunder Hamfest 71 will be held at the Dellview Hotel in Lake Delton, Wisconsin on May 23rd. There will be afternoon programs and an evening banquet. Tickets are $5.00 in advance or $5.75 at the door. For further information contact Kenneth A. Ebneter, K9GSC, 822 Wauona Trail, Portage, Wisconsin 53901.

Irwin, Pennsylvania

The 17th annual Breeze Shooters Hamfest will be held at White Swan Park, Parkway West near the Greater Pittsburgh Airport on May 23th. For additional details write D. J. Myslewski,, K3CHD, 45 McMahon Drive, Irwin, Pa. 15642.

Henniker, New Hampshire

The Bow Radio Association and the Contoocook Calley Radio Club, Inc., are sponsoring an auction and flea market on Sunday, May 23rd. The flea market will start at 10:00 A.M. (bring your own tables) and the auction will start at 2:00 P.M. The place is Heyser Pond Cottages, Henniker, New Hampshire (off Rte. 202 & 9, near the junction of Rte. 127 by the Hopkinton town line.).

Ottawa, Illinois

The Starved Rock Radio Club will hold their annual SRRC Hamfest at the La Salle County 4-H Home and Picnic area southwest of Ottawa, Illinois on June 6th. An all day affair with plenty of activities. Advance tickets, $1.50 and $2.00 at the door. Follow big, yellow, hamfest signs on Rte. 71 from south end of Illinois River Bridge at Ottawa, Illinois. For further details write W9MKS/W9QLZ SRRC, RFD #1, Box 171, Oglesby, Illinois 61348.

Rome, New York

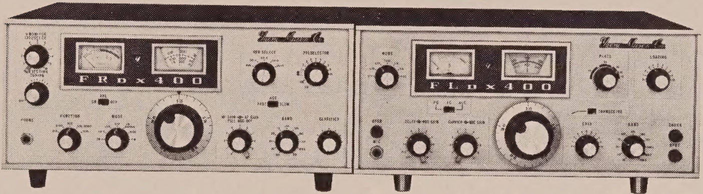
The Rome Radio Club, Inc. sponsors its 18th consecutive Ham Family Day on Sunday, June 6th at Becks Grove, 10 miles west of Rome, N.Y. A full day of programs and activities for the entire family ending with a chicken and steak dinner at 5:00 P.M. Advance adult tickets are $5.00 with children under 12 at $2.00 (under 6 are admitted free). Tickets at the door are door are $.50 extra. For reservations and information write to Rome Radio Club, Inc., P.O. Box 721, Rome, N.Y. 13440.

Evensville, Indiana

The Evansville, Indiana Hamfest will be at the 4-H grounds (Highway 41 north 3 miles), Sunday July 11th. Air conditioned auction, overnight

[*Continued on page 88*]

Now you don't have to pay twice the price to get twice the rig.



Picture this pair in your shack. The Yaesu FLdx 400 transmitter and the FRdx 400 receiver. Loaded with power. Loaded with sensitivity. Loaded with features. Loaded with value. Read on, and discover how you can have the most up-to-date receiver-transmitter rig in the world . . . and at an unbelievably low price.

The FRdx 400 Receiver

Get a big ear on the world with complete amateur band coverage from 160 meters through 2 meters, including WWV and CB reception. Four mechanical filters do it — they provide CW, SSB, AM and FM selectivity. Separate AM-SSB-FM detectors are included, along with squelch and transmit monitor controls. Plus a noise limiter and a variable delay AGC. And a built-in notch filter with front panel adjust for notch depth.

The FRdx includes calibration markers at 100 KHz and 25 KHz, with accurate calibrator checks verified by WWV. A solid-state FET VFO for unshakable stability. And a direct-reading 1 KHz dial affords frequency read-out to less than 200 Hertz.

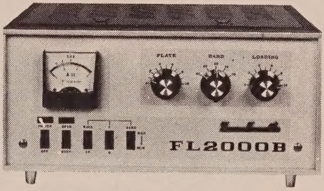
The FRdx 400 sells for $359.95.

The FLdx 400 Transmitter

Here's how to set yourself up with dual receive, transceive or split VFO operation. The FLdx 400 with its companion receiver brings you the ultimate in operational flexibility. Flexibility like frequency spotting, VOX, break-in CW, SSB, AM and even an optional FSK circuit.

The completely self-contained FLdx 400 features a built-in power supply, fully adjustable VOX, a mechanical SSB filter, metered ALC, IC and PO. A completely solid-state FET VFO provides rock-solid frequency stability.

We rate the FLdx 400 very conservatively. That rating guarantees you 240 W PEP input SSB, 120 W CW and 75 W AM. The FSK option will go all day at a continuous 75 W. And you get full frequency coverage on all amateur bands — 80 meters through 10 meters — with an optional provision for certain other bands that you can personally specify. For all that, you pay just $299.95.



FL2000 B Linear Amplifier.

Ideal companion to the Series 400, this hand-crafted linear is another example of Yaesu's unbeatable combination of high quality and low cost. Designed to operate at 1500 watts PEP SSB and 1000 watts CW, this unit provides superb regulation — achieved by a filter system with 28 UF effective capacity.

Other features include dual cooling fans (one for each tube), individual tuned input coils on each band for maximum efficiency and low distortion, and a final amplifier of the grounded grid type using two rugged carbon-plate 572 B tubes. Ready to operate at only $299.95.

SPECTRONICS WEST

Dept. C, 1491 E. 28th, Signal Hill, Ca. 90806 / (213) 426-2593

SPECTRONICS EAST

Dept. C, Box 1457, Stow, Ohio 44224 / (216) 923-4567

☐ Please send new color catalog of all Yaesu products.

☐ Enclosed find $__________

Please send model(s) ________________

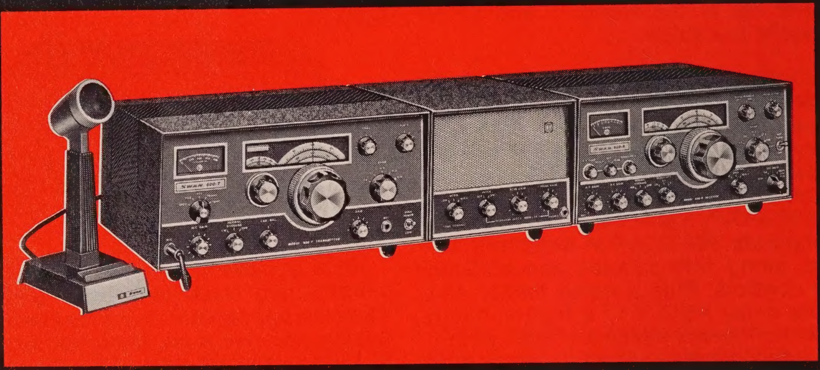
Name________________________

Address______________________

City__________State______Zip______

All prices F.O.B. Signal Hill, Ca.

introducing



the new

SWAN TWINS

MODEL 600-R

The finest amateur band receiver and transmitter units available. These units combine all of Swan's proven engineering and craftsmanship, and include all the deluxe Swan features that have made Swan transceivers the largest selling transceivers in the world.

MODEL 600-T

Examine the list of features and specifications, and compare them with those of any other receiver and transmitter units on the market... then compare the prices. The amateur radio operator now has a new standard of performance, quality, reliability and value in transmitters and receivers.

The Swan 600T Transmitter and 600R Receiver!

SWAN
ELECTRONICS
A Subsidiary of Cubic Corporation

EASTERN OFFICE
P.O. Box 151
Freehold, N.J. 07728

FACTORY
305 Airport Road
Oceanside, CA. 92054

600-R SPECIFICATIONS:

- SSB, CW, AM and FSK superheterodyne receiver.
- Freq. Range: In addition to full coverage of 10, 15, 20, 40 and 80 meters, continuous coverage from 3 to 30 mc may be provided with an external oscillator, either tunable or crystal controlled.
- Ultra-smooth vernier tuning, with large knob and dial. The incomparable feel of the Swan tuning system.
- Sensitivity: ¼ microvolt at 50 ohms for 10 db signal plus noise-to-noise ratio.
- Selectivity: 2.7 Kc bandwidth with 1.7 shape factor is standard. Options include 0.5 Kc CW filter, 4 Kc AM filter, and SS-16 super selective filter.
- Crystal Calibrator with 25 and 100 kc selection.
- Hybrid Design: 7 tubes, 8 transistors, 12 diodes. Transistors used where they provide definite advantage. Tubes used where they still provide superior performance.
- Features Swan's exclusive Single Conversion design, with fewer spurious responses than multi-conversion designs.
- Fully compatible with 600-T transmitter, providing for transceive operation as well as separate frequency control. Also, CW sidetone, and genuine CW break-in operation.
- Built-in AC power supply.
- Dimensions:
  15 in. wide, 6½ in. high, 12 in deep.

$395*

600-T SPECIFICATIONS:

- Freq. Range: Full coverage of 10, 15, 20, 40 and 80 meters. Extended frequency coverage for MARS operation with plug-in crystal oscillator accessory, Model 510X.
- Power Rating: 600 watts P.E.P. input. 500 watts CW, 150 watts AM. 100 watts continuous AFSK.
- Pi-Network output for 50 or 75 ohm coax.
- Suppression: Carrier 60 db, unwanted sideband 50 db. Third order distortion approx. 30 db.
- Audio response: Plus or minus 3 db from 300 to 3000 cycles.
- CW Keying: Grid block circuit, Full Break-in system. Includes sidetone to receiver.
- VOX accessory, plug-in.
- Internal AC Power Supply.
- Dimensions:
  15 in. wide, 6½ in. high, 12 in. deep.

$495*

600-R ACCESSORIES:

Speaker in matching cabinet	**$18 ***
I.F. Noise Blanker. Installs internally	**$79 ***
Adjustable Audio Notcher. Installs internally	**$44 ***

*Factory price

500CX
$449*

THE SWAN 500CX 550 WATT 5 BAND TRANSCEIVER

With the cleanest, most readable signal on the air, and unequalled selectivity, provided by a high frequency crystal lattice filter superior to all others.

The exclusive single conversion design of the 500CX results in greatly reduced image and spurious response.

The dual-ratio planetary dial drive gives you velvet smooth, precision tuning that is virtually free of backlash.

All these features, combined with Swan's proven craftsmanship performance, and rugged reliability make the 500CX the finest transceiver value made anywhere. . . .

Swan 500cx
SSB TRANSCEIVER

Send for catalog on the complete Swan line.

*Factory Price

SWAN
ELECTRONICS
A Subsidiary of Cubic Corporation

SWAN FACTORY
305 Airport Road
Oceanside, Ca. 92054
Phone: (714) 757-7525

EASTERN OFFICE
P.O. Box 2288
Ocean, New Jersey 07712
Phone: (201) 431-0707

MARK II LINEAR AMP
$499* (complete with tubes and power supply)

2000 WATTS P.E.P.

With a conservative power rating of 2000 watts P.E.P. Provides full coverage of the amateur bands from 10 through 80 meters, and MARS frequencies. Planetary vernier drives on both plate and loading controls for velvet smooth tuning of the amplifier. Complete with two Elimac 3-500Z Triodes.

MATCHING POWER SUPPLY

Component quality is of the highest caliber

*Factory Price

Swan-Mark II

Send for catalog on the complete Swan line.

SWAN
ELECTRONICS
A Subsidiary of Cubic Corporation

SWAN FACTORY
305 Airport Road
Oceanside, Ca. 92054
Phone: (714) 757-7525

EASTERN OFFICE
P.O. Box 2288
Ocean, N.J. 07712
Phone: (201) 431-0707

270B
$399*

SWAN *Cygnet* 270B

SSB TRANSCEIVER

The 5 band deluxe 270B. with a power rating of 260 Watts P.E.P., is a complete self contained radio station with built-in AC power supply and speaker in one compact, portable package. You can take it with you on vacation or business trips, operate from your motel room, your boat, car, or hide-away cabin. All you do is connect to an AC power source and antenna, plug in your mike and you're on the air, with enough power to work the world.

The Swan Cygnet 270B is a world traveler. And the price is a world beater!

*Factory Price

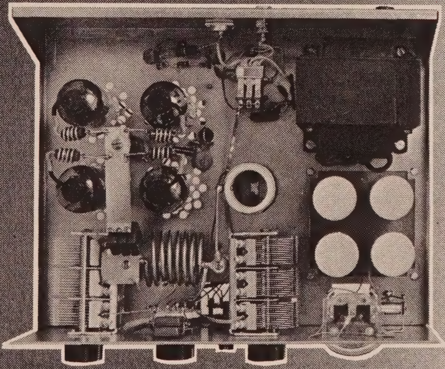
SWAN
ELECTRONICS
A Subsidiary of Cubic Corporation

SWAN FACTORY
305 Airport Road
Oceanside, Ca. 92054
Phone: (714) 757-7525

EASTERN OFFICE
P.O. Box 2288
Ocean, N.J. 07712
Phone: (201) 431-0707

Send for catalog on the complete Swan line.

1200W
$189*



SWAN 1200W
1200 WATT LINEAR AMPLIFIER WITH SELF CONTAINED AC POWER SUPPLY

We built this little gem to go with our Cygnet 270B. But when word got around that Swan had a 1200 Watt amp with a built-in AC power supply, for just one hundred and eighty-nine bucks, we were swamped! Production has finally caught up with sales again, so see your dealer soon.

*Factory Price

SWAN
ELECTRONICS
A Subsidiary of Cubic Corporation

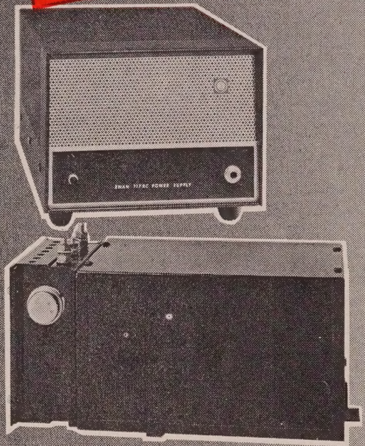
SWAN FACTORY
305 Airport Road
Oceanside, Ca. 92054
Phone: (714) 757-7525

EASTERN OFFICE
P.O. Box 2288
Ocean, N.J. 07712
Phone: (201) 431-0707

Send for catalog on the complete Swan line.

AC Power Supply $59*

12 DC Power Supply $118*



MODEL 117XC AC POWER SUPPLY

Complete AC supply for 117 volts, 50-60 cycle, in matching cabinet with speaker, phone jack and indicator light. Complete with AC cord, ready to plug into transceiver. $95*

COMPLETE 12 VOLT DC SUPPLY MODEL 14-117

Consists of basic AC supply and a D.C. converter (Model 14-C). Use both units for mobile operation, or remove DC converter and power supply can be operated from AC line by plugging in AC cord. $118*

MODEL 117-X BASIC AC POWER SUPPLY

A complete AC supply in plain black box. $59*

MODEL 230-X For 230 or 117 volts AC input, $65*

MODEL 14C

Converts 117-X or 230-X to 12 volt DC input, negative ground. $59*

MODEL 14CP for positive ground $59*

*Factory Price

SWAN
ELECTRONICS
A Subsidiary of Cubic Corporation

SWAN FACTORY
305 Airport Road
Oceanside, Ca. 92054
Phone: (714) 757-7525

EASTERN OFFICE
P.O. Box 2288
Ocean, N.J. 07712
Phone: (201) 431-0707

Send for catalog on the complete Swan line.

VFO's

MODEL 508	**$129***
MODEL 510X	**$44***
MODEL 210	**$99***

MODEL 508
EXTERNAL VFO

Provides facilities for transmitting and receiving on separate frequencies. Full coverage is provided on the 10, 15, 20, 40 and 80 meter bands, with 10 meters divided into 4 segments for improved vernier control and frequency readout.

MODEL 510X
CRYSTAL OSCILLATOR

For MARS operation outside the amateur bands, and net operation in the 80, 40, 20 and 15 meter bands. A ten position switch allows selection of up to ten crystal frequencies with vernier control for adjustment to exact frequencies.

MODEL 210 VFO
UNIT FOR 6 METERS

For full coverage of the 50-54 mc band when used with the Swan 250C transceiver.

*Factory Price

SWAN
ELECTRONICS
A Subsidiary of Cubic Corporation

SWAN FACTORY
305 Airport Road
Oceanside, Ca. 92054
Phone: (714) 757-7525

EASTERN OFFICE
P.O. Box 2288
Ocean, N.J. 07712
Phone: (201) 431-0707

Send for catalog on the complete Swan line.

REMOTE CONTROLLED MOBILE ANTENNA $99*

SWAN MOBILE ANTENNAS

No coil changing with our Models 45 and 55B Mobile Antennas. They cover 10, 15, 20, 40 and 75 meters with our patented vertical switch that provides 5 stops for full coverage of these bands. High radiation efficiency is provided by the high Q coil.

5 BAND MANUAL SWITCHING MODEL 45
Provides coverage for all 5 bands, with manual switching. $69*

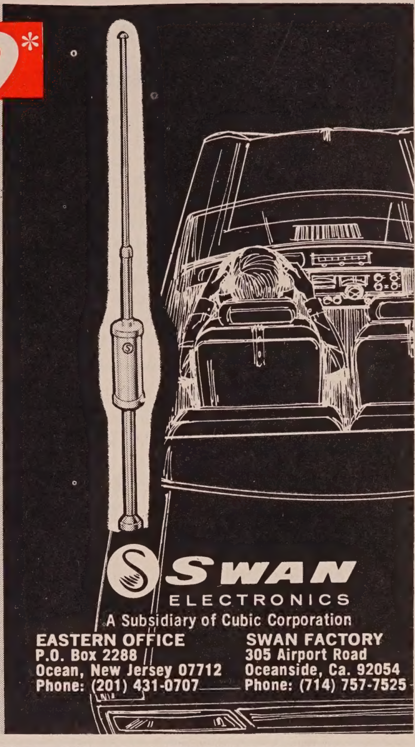
5 BAND REMOTE CONTROL MODEL 55B
Control box under car dash permits instant band changing while driving. $99*

SINGLE BAND MODEL 35
For maximum radiation efficiency, this single band design is the best.
With 20 meter coil. . . . . $\$44^{40}$*

Coils for 15, 40 and 75 meters also available.

*Factory Price

Send for catalog on the complete Swan line.



SWAN ELECTRONICS
A Subsidiary of Cubic Corporation

EASTERN OFFICE
P.O. Box 2288
Ocean, New Jersey 07712
Phone: (201) 431-0707

SWAN FACTORY
305 Airport Road
Oceanside, Ca. 92054
Phone: (714) 757-7525

NEW LOW PRICES

Send for catalog on the complete Swan line.

SWAN TRIBAND BEAM ANTENNAS REACH A LOT FARTHER (for a lot less.)

The outstanding performance of our antennas is due largely to our patented trap design, which permits precision factory adjustment. These precision tuned traps result in maximum forward gain and front-to-back ratio from each Swan antenna. Performance is comparable to single band antennas having the same number of elements.

Before you select your antenna . . . compare the Swan tribanders feature for feature with other brands. They reach a lot farther, for a lot less.

4 element Model TB-4H	$119*
3 element Model TB-3H	$ 99*
3 element Model TB-3	$ 84*
2 element Model TB-2	$ 69*
Vertical Trap Antenna, Model 1040	$ 49*

*Factory Price

SWAN ELECTRONICS
A Subsidiary of Cubic Corporation

SWAN FACTORY
305 Airport Road
Oceanside, Ca. 92054
Phone: (714) 757-7525

EASTERN OFFICE
P.O. Box 2288
Ocean, New Jersey 07712
Phone: (201) 431-0707

Swan's new marketing program includes these regional Swan Distributors

If you wish to trade or finance your Swan equipment, write or visit your nearest regional distributor. They all carry the complete line, in stock, and on display.

If you have no trade and it is convenient to pay by check, money order, or through Master Charge or BankAmericard, we will be happy to receive your order at our Eastern Office or here at the factory in California.

Either way with our new low prices and the famous Swan customer service policy that is second to none, Swan amateur equipment is by far your best value.

Swan speaks your language . . . now more than ever. Write for the complete Swan catalog.

AUTHORIZED
SWAN
ELECTRONICS
DISTRIBUTOR

Henry Radio, Inc.
11240 West Olympic Blvd.
Los Angeles, Calif. 90064
Phone: (213) 477-6701

Henry Radio, Inc.
931 North Euclid Avenue
Anaheim, California 92804
Phone: (714) 772-9200

Henry Radio, Inc.
211 North Main Street
Butler, Missouri 64730
Phone: (816) 679-3127

CW Electronics Sales Co.
1401 Blake Street
Denver, Colorado 80202
Phone: (303) 244-5523

Freck Radio
38 Biltmore Avenue
Asheville, North Carolina 28801
Phone: (704) 254-9551

The Ham Shack
328 S. Orange Blossom Trail
Orlando, Florida 32805
Phone: (305) 423-0891

Arrow Electronics
207-02 Northern Blvd.
Bayside, L.I., N.Y. 11361
Phone: (212) 224-1234

The Ham Shack
1966 Hillview Street
Sarasota, Florida 33579
Phone: (814) 955-7161

HCJ Electronics
8214 East Sprague
Spokane, Wash. 98225
Phone: (509) 924-2343

Ham Radio Outlet
999 Howard Avenue
Burlington, Calif. 94010
Phone: (415) 342-5757

Ed Juge Electronics
3850 South Freeway
Ft. Worth, Texas 76110
Phone: (817) 926-5221

Gene Hansen Company
Box 386, Albuquerque
New Mexico 87048
Phone: (505) 898-3251

SWAN FACTORY
305 Airport Road
Oceanside, Ca. 92054
Phone: (714) 757-7525

SWAN
ELECTRONICS
A Subsidiary of Cubic Corporation

EASTERN OFFICE
P. O. Box 2288
Ocean, New Jersey 07712
Phone: (201) 431-0707

Send for catalog on the complete Swan line.

SWAN VHF FM
TRANSCEIVER FOR 2 METERS

All solid state construction with no final tubes to waste battery power. Price includes microphone, AC power supply, and mobile mounting bracket. Frequency range is 144-148 mc, with 12 channels (2 supplied).

Built to our specifications by a highly respected Japanese manufacturer, and backed by Swan's famous service policy.

VHF 150
2 METER FM AMPLIFIER

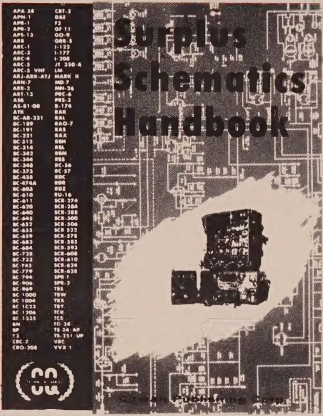
A self contained 150 watt amplifier for home use, or with the Swan 14C DC converter may be used in mobile operation. Price includes built-in 117 or 230 VAC input with line cord.
$249*
***Factory Price**

SWAN
ELECTRONICS
A Subsidiary of Cubic Corporation

SWAN FACTORY
305 Airport Road
Oceanside, Ca. 92054
Phone: (714) 757-7525

EASTERN OFFICE
P.O. Box 2288
Ocean, N.J. 07712
Phone: (201) 431-0707

SURPLUS SCHEMATICS HANDBOOK



Partial list of contents:

ARC1
ARC33
ARC5
ARC7
ART13
BC189
BC344
BC610A
BC640
BC728
RAX
SCR274
SCR284
SCR506
SPR2
TBW

This is a book literally loaded with schematics for all the currently popular pieces of surplus gear. Most amateurs are well aware of the problems encountered in purchasing seemingly inexpensive surplus units, only to find that no schematic diagram is available.

$2.50

CQ MAGAZINE
14 VANDERVENTER AVENUE
PORT WASHINGTON, L. I., N. Y. 11050

SIRS: My check (money order) for $__________ is enclosed. Please send ________ copies of the SURPLUS SCHEMATICS HANDBOOK.

Name ____________________

Address ____________________

City ______________ State ______ Zip ______

SWAN ORDER FORM

① **Print or write clearly:**

NAME ____________________ CALL ____________

STREET ADDRESS ____________________

CITY ______________ STATE ______________ ZIP ________

② **Please ship me the following Swan Equipment.**

QUANTITY	MODEL #	DESCRIPTION	PRICE EACH	TOTAL

TOTAL AMOUNT OF ORDER	
5% SALES TAX Calif. Residents	
TOTAL	

③ A **Check how you want order shipped.**

☐ SURFACE FREIGHT, BEST WAY
(Swan pays shipping charges, except on C.O.D.)

③ B **OR Ship the following way, FREIGHT COLLECT**
(Customer pays charges)

☐ AIR FREIGHT ☐ AIR EXPRESS ☐ OTHER

④ **Payment by: (check one)**

☐ CASH (by reg. mail) ☐ CHECK
☐ C.O.D. ☐ MONEY ORDER
☐ BANKAMERICARD ☐ MASTER CHARGE

____

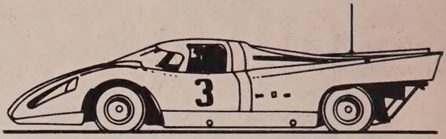
MAIL TO:

SWAN FACTORY
305 Airport Road
Oceanside, Ca. 92054

EASTERN OFFICE
P.O. Box 2288
Ocean, New Jersey 07712

All prices and specifications subject to change without notice.

RADIO CONTROL



MODEL CAR RACING

BY HOWARD G. McENTEE,* W2SI

Following up his previous articles on the intricacies of Model Control by radio, W2SI describes one of the fastest growing R/C fields: Model Auto Racing. All you would-be Mario Andretti's, Pedro Rodriguez', and Mark Donohue's can now share much of the excitement of auto racing from behind a control box rather than the wheel of a racing car.

THOUGH radio controlled car racing is one of the fastest-growing branches of R/C today it is certainly not new. For many years experimenters have been putting R/C installations of various sorts in model cars, though most of these efforts have utilized electric drive power. Not too many years ago this was a favorite wintertime sport of several R/C clubs—a way to keep their hand in and their enthusiasm up during long cold winter months.

The present upsurge in model R/C racing cars began as the slot slot car craze faded out —and like slots, it came out of California. But while vast numbers of slot car devotees were youngsters—you could put a pretty good car into operation for five bucks, and run it at reasonable cost on one of the commercial tracks to be found in most neighborhoods—R/C race cars are a far different and much more costly breed. The average age of enthusiasts is therefore much higher—around 30 we understand.

ROAR

A group of modelers from the Los Angeles area formed a group called the "Radio Operated Auto Racing Association"—ROAR for short—in 1967, set up rules for cars and their operation and started attracting recruits. At that time there were few sources of parts made expressly for model cars—you had to make just about everything yourself, or adapt parts from toys and other sources. The radio equipment, of course, was exactly the same as that used for model planes—as most of it still is today. Soon one supplier entered the scene, then a few more. Today there must be some 10 concerns which specialize in model cars and parts, and many of the long-established model plane and hobby manufacturers have entered the field too.

From the very first, ROAR rules have been based upon realism; all cars had to be recognizable copies of full-sized racers, every car had to have at least a driver's head visible in the cockpit. Despite the fact most parts were homemade, the early cars were surprisingly complex. All wheels were fully sprung; most had 2-speed gear boxes shiftable by radio). ROAR had specified that all cars were to be to 1/8th scale (1½" to the foot), and that maximum engine size would be held to 0.19 cu. in. displacement. The engines were those in the plane field, of course. Every car had proportional steering and throttle, plus the means to shift gears. Multiple universal joints were required from the rear-mounted transmission to the sprung wheels. Because of all these complications the cars were *costly*, which undoubtedly held back growth for a time.

---

*490 Fairfield Ave., Ridgewood, N.J. 07450.

At that time, too, there were very few propo R/C systems with less than 4 controls —most had five or more; this too made it expensive for newcomers to the sport.

Along with a plentiful supply of all sorts of car parts today (and competition between makers to hold prices down to a reasonable level) we have many 2- and 3-control digital systems. At least one of the latter (Orbit) is designed especially for car racing, and more may very likely follow.

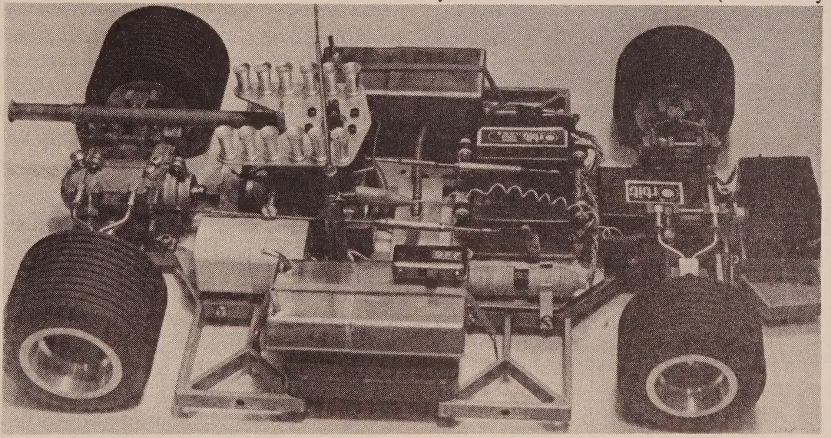
Racing Car Kits

Today a few cars are sold in finished and ready-to-run form, but probably the majority are made from kits. Some suppliers offer their cars either way. Car kits range roughly from $50 to $150. Suitable engines run $15-$30. Car bodies are almost all molded from some sort of plastic—ABS, fiberglass and so on—cost $5-$10 each; they come unfinished, but can be decorated with paint, model dope etc. Some standard paints available most everywhere have been found suitable, and also fuel-proof. The latter is important; even though the glow plug engines are *inside* the body and usually well toward the rear, and despite the fact that many cars have exhaust stacks directed rearward, engines are decidedly dirty in operation, and fuel residue seems to go most everywhere! Actually, raw fuel will soften most finishes, but exhaust fumes (which contain lots of oil) will not harm those that are more resistant.

An Expensive Pastime

Radio systems suitable for cars cost from $130-$200 complete, depending upon whether you get them in kit form or finished, and whether they are two or three-control outfits. Again, most radio makers (except Heathkit) offer their systems either way.

So what will it cost to get a representative car and adequate radio system right now? Probably the Heath Spectre and the matching Heath GD-57 radio system offers the best buy for those who want to get their feet wet in this new sport. The Heath car is rugged and very well engineered; while it is not considered among the top competition cars by many, it *has* won many races—and gotten many persons started in model car racing who probably would not have been able to afford the more exotic cars. As far as we know, the Spectre at $49.95 is the lowest-priced complete car kit on the market. It is not an exact scale model, but the body is closely representative of Gran Tourismo (GT) cars. Heath does not make an engine, but stocks the Veco .19 ($29.95), considered one of the better race car engines. The Spectre is designed especially for this engine but the chassis can also accomodate most others with little or no alterations. Both the Spectre and the GD-57 radio system kits include the usual complete Heathkit instruction manuals, which certainly serve to speed the novice in successful completion of the kits. To show the time required, this writer assembled the Spectre completely in about 13 hours, while the radio system took about 18 hours (familiarity with



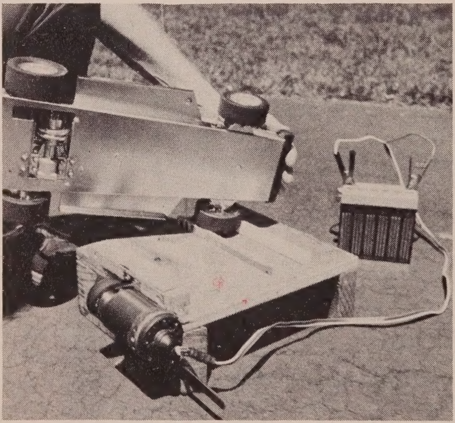
One of the most advanced cars—and most complex—made today, by Dynamic Models. Has classis fore-aft engine mounting, two-speed transmission between rear wheels. All wheels fully sprung. Fuel tanks attached to outriggers on both sides. "Exhaust stack assembly" on top of engine is really for extra cooling. Pipe to left carries actual exhaust.

Heathkit R/C systems no doubt speeded the radio job, but this was our first R/C car experience). Few problems were encountered on the car, none at all in the radio system. If you run into a serious bug, Heath has some 25 Service Centers in the US and Canada that can help.

Drive Train

As with most model engines used in R/C cars, a new Veco .19 should be "run-in" for an hour or so at moderate speed, with a model airplane propeller installed before installation in the car. This is for "break-in"; it loosèns up the parts and readies them to run at the high speeds reached by model car engines. One of the real problems in these cars is affording good cooling for the engine. Model plane engines are designed to operate pretty much in the open, well cooled by the movement of the plane through the air, and the added prop blast. In a car they are closely-confined, with little air movement around their cooling fins. Car engines therefore all utilize additional cylinder head cooling fins, which seem to take care of the matter.

Most car enthusiasts have some sort of electric starter for their engines. Some model car engine flywheels are grooved, and a very adept operator can pull a heavy cord around the groove for starting. This can be an exasperating operation with a balky engine though! Surprisingly, a bicycle makes a fine starter; with the bike turned upside down and someone turning the crank, the car is simply held against the rear tire for a quick start. Car engines are set low in the chassis, so that the lower edge of the flywheel projects a quarter inch or so beneath the chassis underside. The flywheels have knurled outer surfaces, for a good grip on the bicycle tire, or an electric starter. The latter are small high power motors, usually driven by 12v. lead-acid batteries (very compact motor scooter batteries do nicely). A rubber surfaced wheel on the motor shaft is mounted so the car flywheel may be pressed down onto it for quick starting.



Haywire starting platform of scrap lumber. Starting motor (a type sold for model plane use) attached to left end, small 12v. battery right rear. Projecting rim of flywheel seen near right wheel is pushed down upon starter motor wheel. Lever projecting downward under motor turns it on.

From the very beginnings of the ROAR experiments, model engines have been fitted with centrifugal clutches, usually designed to fit into and work as part of the flywheel. These clutches are set to engage at speeds far higher than engine idling speed, so the engines don't have to be slowed down as far as they do on model planes. Since all engine throttles are proportional, it is possible to engage these clutches very smoothly; most clutches have replaceable friction shoes to take care of wear. On cars with gear boxes, the clutch goes between engine crankshaft and gearbox input. On sidewinders (see below) the clutch outer housing holds a small pinion which engages a large gear on the drive shaft. Most cars also carry simple brakes of some sort. Engine compression will slow down a car from high speed quite well, but when the clutch disengages the car might still be moving quite fast. The Heath car uses the outer housing of the clutch as a "brake drum"; the brake shoe is tied in with the throttle linkage, starts to go into action as the throttle is reduced and the clutch releases. Incidentally, most cars with sidewinder engine mount have unsprung rear wheels, but front wheels are always sprung.

Sidewinders

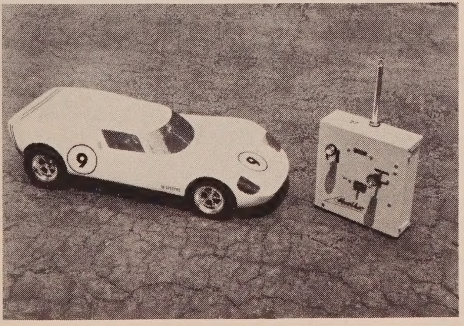
One of the reasons car costs have gone down has been the discovery that the two-speed gear box thought to be mandatory on early cars really isn't, and that much simpier drive systems will do a fine job—and win races. With the gear box, the engine was mounted with the crankshaft fore and aft on the chassis. Without the gear box the engine is mounted with the crankshaft crossways; such cars are termed "sidewinders". Drive power is transferred from engine to rear wheels either by gearing or by belt (cog-type belts are best as they will not allow slippage).

The more knowledgeable drivers change gear ratios to suit the type of racing to be done, just as is done in full-sized cars. Without the gear box, only two proportional channels are required. While the Heathkit GD-57 system can handle three servos, it comes with only two, since the Spectre is a sidewinder. The latter type of car makes two-control systems entirely adequate for car racing too, allowing further cost reduction.

Quite a few model plane fliers have become enthusiastic car racers. As someone has pointed out, a model plane crash can be a "total"—plane, engine and even most of the radio system wiped out. Cars crash too—they run off the track, hit barricades strategically placed for just this reason, one or more cars can collide due to spin-outs or wild driving etc. But the results are seldom worse than dented bodies, bent front ends etc. If properly mounted, the engine, radio equipment and most of the vital parts are seldom damaged. Most cars are soon back on the track after they have crashed, running as well as ever. There are among us, of course, many "frustrated Gran Prix drivers"; model car racing offers a reasonably low-cost way to work out such frustrations. This probably influences the changeover to cars from planes by some of the model aviators; another influence is the fact that they already have the radio equipment, which can do double duty.

Control Frequencies

The present FCC rules allow *only* model aircraft operation on the five spot R/C frequencies in the 72-76 mc portion of the Citizens Radio Service. Thus cars may be operated legally on all the 27 mc R/C spots, also on those popular for R/C in the upper end of the ham 50 mc band. Several proposals are before the FCC at present which may change the disposition of spot frequencies and types of R/C models that may be operated on 72-76 mc. The model boatmen are also after some spots in this range (many operate illegally there now). Generally, R/C planes require the highest transmitter power; they are sometimes flown well over a quarter mile away from the pilot. R/C model sailboats require a fair range too, especially for racing; model powerboats generally are kept quite close to the transmitter, as are model race cars. One simply can't see what the little cars are doing, when they are too far away, and racing courses are set up with this in mind. It is felt possible that car R/C systems could do nicely with transmitter powers of under 100 mw, so they would come within the provisions of the FCC Part 15 rules. This would open the possibility license-free operation, using quite a few spots in the 27 mc area not allowed presently for R/C, and they



Spectre and Heathkit 3-control transmitter.

Sources of Further Information

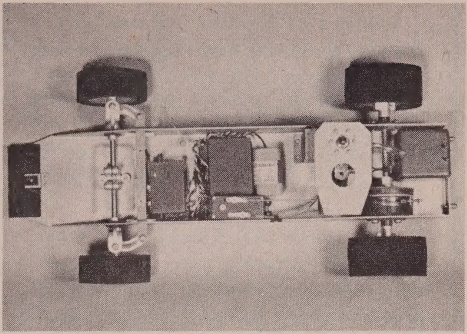
Radio Operated Auto Racing Assoc. (2855 Velasco Lane, Costa Mesa, Calif. 92626). Yearly dues $5, brings monthly *Revup* bulletin. Headquarters can tell you where groups gather or race in your particular area. ROAR has many foreign members.

Pit Stop (Box 487, Sierra Madre, Calif. 91024). Only magazine devoted exclusively to auto racing, with considerable content of model RC car material. Yearly sub. $7.

Car Racing by Radio Control; up-to-date book on model R/C car racing, covers tuning, rules, engine info, radio theory etc. Check or M.O. for $3.95 to George Siposs (2855 Valasco Lane, Costa Mesa, Calif. 92626).

Catalogs: Many concerns advertising in *Pit Stop* and in the model plane magazines offer catalogs at low cost. One of the most complete is that from Delta Systems (Box 754, 4363 Selwyn Lane, Bridgeton Mo. 63042). This $1 catalog contains many pages of general model car info, as well as comprehensive listing of Delta cars and accessories. 30 pages.

Manuals: Spectre assembly manual (Heath Co. Benton Harbor, Mich. 49022) is a 48 p. book with many foldouts, costs $2. Much useful info in this car, its construction, running, etc.



Top view of car chassis of Citizen-Ship Radio's "Curtis-Car." Note large extra cooling plate on cylinder head of engine (six bolts in circle at right. Just to rear of plate at lower right is clutch and brake assembly, driven by toothed belt from engine flywheel. Steering servo on side, just rear of front wheel tiebar. Throttle-brake servo along lower chassis side, receiver and battery above it. Fuel tank far right.

could still keep clear of CB phone interference. Extensive trials will be needed to prove or disprove under 100 mw operation.

As with other types of R/C racing, quick-frequency-change is most helpful. This has been available in German R/C equipment for years, but is just being offered by our own makers now. It will doubtless expand. Easily-removable crystals are utilized in both transmitter and receiver (all R/C superhets are crystal-controlled) and with a shift of crystals, no retuning is required. Of course this requires a compromise in initial tuning, and output is not as high (or receiver sensitivity as good) on every spot frequency in the 27 mc band, for example. But despite the inevitable drop in system efficiency when operating off the center frequencies to which such systems are tuned, this sort of frequency change has proven quite acceptable.

Electric Cars

Many model race car drivers wouldn't enjoy the hobby if it weren't for the snarl of the glow engines, the very high speeds they allow (up to 30 m.p.h. or more actual), even the smell of burning castor oil! But there *are* places and conditions that don't allow the use of glow engines. Here electric drive would be ideal—and one maker is seriously involved in this field. The Scorpion (Control Technology Inc. has several very interesting tricks. For example, three cars may be raced together, utilizing only *one* r.f. channel. Each driver has a box with steering and throttle levers, of course, but only one box has any r.f. circuitry. This is a digital system, and the six digital channels required for the three cars are simply all funneled out through the one r.f. unit and antenna. With this system it would be possible to race as many as 15 cars together, on the 27 mc R/C spots! Each car receiver has a three-position switch, so that it can be handled by any of the three pairs of digital outputs from three different control boxes.

Since drive power is electric (small sealed lead-acid batteries of six or 12v. are utilized), proportional semiconductor switching can be utilized to give any motor speed, either forward or reverse. So far these cars haven't reached the speeds attained by glow-engined racers—the maker claims top speed of 20 m.p.h. (the average glow-engined car can hit around 25 m.p.h.—but they can be operated in many places where the noise, oil drippings, smoke and fire hazard of gasoline powered engines would be completely banned. Indoor racing in the winter months comes immediately to mind.

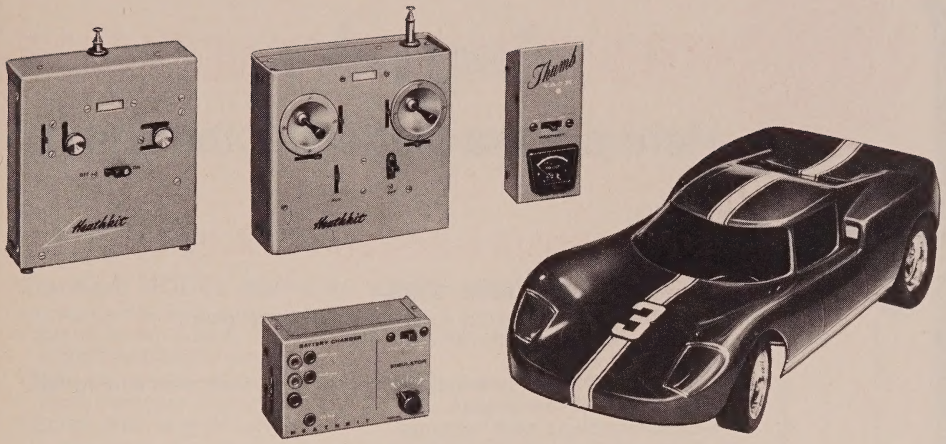
Economy Systems

What does a person with an urge for racing do, if he can't afford even a "low-priced" digital system, and car to match? There are some good buys in used equipment at the larger hobby shops. But if you want a lot of fun with a little car you can even operate in your home, there's one on the market. It is a close scale copy of a Mustang Fastback, has electric drive, and proportional steering; the

[*Continued on page 98*]

HEATHKIT
ASSEMBLY MANUAL

Spectre car kit partly assembled. Chassis is heavy steel. Car weight 7½ lb. ready to run. Rear tires (top right) come cemented to wheels, to prevent slippage. Engine, roll bar, front suspension in place here. Aluminum plates at lower right clamp to cylinder head for extra cooling.



Inflation fighters

For what you'd pay for somebody else's propo rig ...you can buy the whole Heathkit® R/C line.

How's that for beating inflation!

Heathkit "Spectre" ⅛ Scale R/C Car

Only complete car kit on the market today . . . at any price. One-piece chrome plated steel chassis is a true frame . . . tracks & handles like a Gran Prix machine at scale speeds of 200 mph. Adjustable caster & toe-in, special formula rubber tires and independent front suspension give "Spectre" cornering traction at speeds that put other cars off the track. Car comes complete with high-impact plastic snap-on body, chassis, wheels & tires, fuel tank & tubing, R/C equipment case & foam padding, gears, axles, servo linkage & mounting tape, all hardware, decals, numbers . . . everything except engine & R/C electronics.

Kit GD-101 R/C car only, 11 lbs. **49.95***

Assembled GDA-101-2 Veco .19 R/C engine, 1 lb. **29.95***

Heathkit 3-Channel R/C System

Reliable digital circuitry for interference-free operation. Powerful transmitter with pre-assembled RF section has trim controls that leave sticks always centered. Receiver housed in virtually indestructable 2 oz. nylon case 2¼″ L x 1³⁄₁₆″ W x 1⁵⁄₃₂″ D. Double-tuned front end, RF amplifier, dual AGC and ceramic IF filters for peak performance. System includes 2 servos with 2 linear and 1 rotary output each for extra versatility. Rechargeable nickel-cadmium battery packs in both transmitter and receiver with built-in charger.

Kit GD-57, transmitter, receiver, 2 servos, batteries, charging cord, switches and soldering iron; specify 27 MHz, 53 MHz, or 72 MHz (for planes only), 8 lbs. **129.95***

Kit GDA-57-1, transmitter, battery, charging cord, (specify freq. desired), 5 lbs. **54.95***

Kit GDA-57-2, receiver only (specify freq. desired), 3 lbs. **34.95***

Kit GDA-19-4, 1 servo, 1 lb. **21.50***

Heathkit 5-Channel R/C System

Powerful transmitter has pre-aligned & assembled RF circuit. Kraft sticks with thumb lever trim adjustment. Flat-pack rechargeable receiver & transmitter batteries. 2.3 oz. receiver has ceramic IF filters for sharp selectivity. Four servos. Choice of 5 frequencies in each of 3 bands. Includes soldering iron.

Kit GD-19, 11 lbs. **219.95***

New Heathkit Servo Simulator

Use it in field contests for making servo adjustments while transmitter is impounded. Takes place of both transmitter and receiver to power servo directly while making adjustments. Can also be used for charging both receiver and glow plug batteries. Powered from either 120 VAC or optional internal battery. Comes complete with extra connectors for receiver battery and servo. Battery not included.

Kit GD-206, 2 lbs. **19.95***

GDA-19-3, optional battery, 1 lb. **9.95***

Heathkit "Thumb Tach"

Measures RPM of any rotating device . . . propellers, gears, flywheels, shafts, etc. Two ranges; 0-5,000 & 0-25,000 RPM. 3% accuracy. No direct connection . . . uses reflected light pulses, can't load engine. Unlimited uses in R/C modeling . . . needle valve adjustments, comparing fuels and glow plugs; indicates power loss, shows peak in RPM you can't hear. Fast, easy assembly.

Kit GD-69, 2 lbs. **19.95***

HEATHKIT
1971

FREE
NEW 1971 CATALOG

Featuring these and dozens of other exciting new kits for home, hobby, test and service, education and recreation . . . over 300 easy-to-build, fun-to-use electronic kits in all. Get your FREE copy now . . . use coupon or write: Heath Company, Benton Harbor, Michigan 49022.

HEATH COMPANY, Dept. 12-4
Benton Harbor, Michigan 49022

HEATHKIT
a Schlumberger Company

☐ Enclosed is $__________, plus shipping.

Please send model (s) __________

☐ Please send FREE Heathkit Catalog. ☐ Please send Credit Application.

Name __________

Address __________

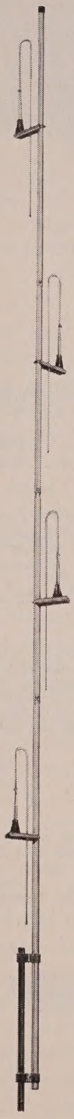
City __________ State __________ Zip __________

*Mail order prices; F.O.B. factory. Prices & specifications subject to change without notice. GX-219R

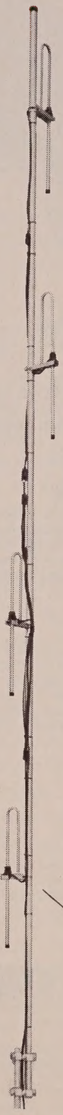
The most powerful antennas under the sun!

FOR 2-METERING AT ITS VERY BEST...

Here are the leaders in the line



362



725

STACKED JAY-POLES

Four-Element MODEL SJ2S4

- All driven array delivering 6.2db omnidirectional gain.
- Power limit 1 KW PEP; 250 watts AM.
- VSWR 1.2:1.
- Uniquely designed phasing and matching harness maintains perfect parallel phase relationship.
- Extremely broad band response.
- Center fed to minimize beam tilting for better low angle radiation.
- Open construction minimizes failure due to moisture and condensation.
- Entire antenna at DC ground.
- Mast height 21′; diameter 2″; may be side mounted on mast or mounted on a roof saddle.

Order No. 362 Ham Net $74.95

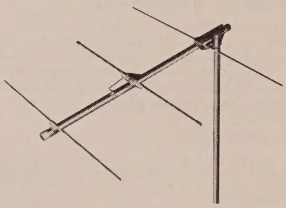
Four-Element MODEL 725

- Commercial Grade.
- Dipoles may be oriented for omnidirectional radiation with up to 6.1db gain, or for offset semidirectional radiation with up to 9.5db gain.
- Broad band response provides SWR of 1.5:1.
- Center fed for best low angle radiation characteristics.
- Antenna at DC ground.
- Easily maintained with replaceable elements and phasing harness.
- Mast height 21′; diameter 2″.

Order No. 725 Ham Net $180.00

MAXIMUM PERFORMANCE BEAMS

Hy-Gain concept in beam construction results in actual delivered performance equalling maximum theoretical gain. Strategically staggered, optimum spaced elements are referenced solely to increased field strength intensity and pattern control, thus delivering tremendous increases in directional gain not attainable with close spaced beams or optimum spaced beams using linearity as the sole reference.



340

Three-Element MODEL 23

- Gain 9db.
- Front to back ratio 20db.
- Maximum power input 1 KW.
- VSWR 1.5:1.
- Longest element 3′6″ on 3′ boom.
- Turning radius 4′.

Order No. 340 Ham Net $9.95

..MAKE IT A hy-gain ANTENNA

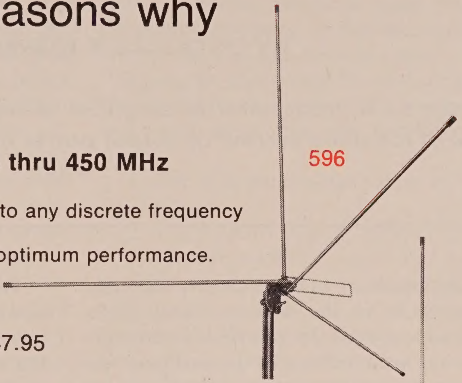
and some of the reasons why

GROUND PLANES

Standard MODEL SGP-2 for 108 thru 450 MHz

- Unity gain ¼ wave length.
- Supplied with cutting chart for tuning to any discrete frequency in the 108-450 MHz range.
- Beta match of feedline to antenna for optimum performance.
- Takes maximum legal power.
- Entire antenna at DC ground.

Order No. 596 Ham Net $7.95

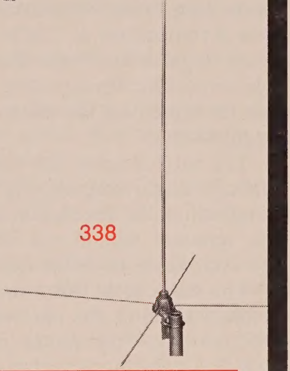


596

Colinear Gain MODEL GPG-2

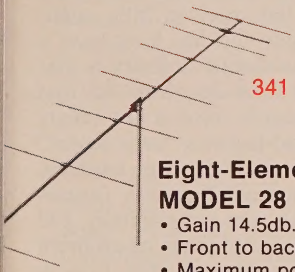
- Only single element omnidirectional gain antenna available for 2 meters.
- Gain 3.4db.
- VSWR less than 1.5:1.
- All steel parts are iridite treated to MIL specs.

Order No. 338 Ham Net $14.95

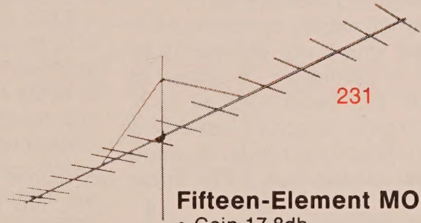


338

See the best dealer under the sun—the one who handles all Hy-Gain products.



341



231

Eight-Element MODEL 28

- Gain 14.5db.
- Front to back ratio 25-30db.
- Maximum power input 1 KW.
- VSWR 1.5:1.
- Longest element 3′6″ on 14′ boom.
- Turning radius 7′6″.

Order No. 341 Ham Net $19.95

Fifteen-Element MODEL 215B

- Gain 17.8db.
- Front to back ratio 25-30db.
- Maximum power input 1 KW.
- VSWR 1.5:1.
- Longest element 3′6″ on 28′ boom.
- Turning radius 14′.

Order No. 231 Ham Net $41.50

HY-GAIN ELECTRONICS CORPORATION
P.O. Box 5407-FF, Lincoln, Nebraska 68505

SSB Power Meters: How To Read Them

BY DOUGLAS H. HORNER,* W0HUF

Is your s.s.b. transmitter or amplifier giving all the power it should? Don't look at the plate current or output power meter to find out. The author tells why.

MANY amateurs (and some professionals) who use s.s.b. on the amateur bands probably have engaged in spirited discussions about what meaning can be derived from the meters on their transmitters. Manufacturers rate a transmitter at "2KW PEP," or "maximum legal input," but the owner/operator has some difficulty equating these ratings with the movement of the meter needle, and FCC regulations.

The subject never has been completely resolved; major engineering organizations of unquestionable reputation do not agree and the amateur should not be embarrassed by his confusion—or difference of opinion.

The purpose of this article is to attempt to explain some of the reasons for this state of affairs—why, "my meter reads so low and Joe, down the block with the same type transmitter gets readings so much higher."

To help illustrate some concepts, s.s.b. can be compared with a.m., because if an a.m. transmitter is modulated in excess of 100%, distortion will occur and an s.s.b. linear amplifier likewise distorts when driven beyond its capability, so a similarity exists between a.m. modulator and s.s.b. linear meter readings.

If a transmitter is modulated with unprocessed speech with the level so adjusted that the peaks occasionally reach 100%, the indicated level of modulation on a "standard" meter will be in the neighborhood of 20% to 30%. The same ratio will exist for an s.s.b. transmitter; if the c.w. input is 1 kw, the average indicated input on speech will be around 200 to 300 watts.

Why do these large ratios of indicated power exist? A number of underlying causes must be covered to offer even a portion of the answer. A part lies in the nature of speech itself which can be divided into:

1. "Voiced' sounds which involve the vocal cords, low frequencies and much power.
2. "Unvoiced" sounds which are produced by moving air through constricted passages formed by the mouth, tongue, teeth, etc. These are higher in frequency and of low average power.

Differences in meter readings with different persons speaking into the same microphone and transmitter will occur because no two voices have the same peak-to-average ratio, and the harmonic energy content of voices varies considerably.

One factor that has received little attention in amateur radio, but has long been a problem in the broadcasting industry is that it is the rule, rather than the exception, that the energy in a person's voice is not evenly distributed above and below a "zero power" reference line. Close study of scope patterns, particularly the trapezoidal pattern formed when monitoring an a.m. transmitter, will reveal that some voices modulate much more heavily in one direction than another. In view that negative modulation peaks cause splatter and positive peaks do not, some broadcast station Chief Engineers cleverly install a line-reversing switch at the audio input to transmitters, and use whatever setting gives the highest average modulation (and highest meter readings) for a particular announcer. This is such a universal problem at least one

---

*1260 E. Avenue, Marion, Iowa 52302

manufacturer supplies a device that causes the audio energy to be symetrically distributed between the positive and negative portions of the envelope.

A few amateurs have reversed the connections to the transformer in their dynamic microphones, thus providing a phase-reversal of the audio signal, which allows the "meters to read higher." This takes place because the shape of the envelope driving the final grid or grids of their s.s.b. exciter has lesser peaks in the positive direction; a.l.c. is derived from small current flow when the final grids are driven positive, so the amplifier is driven to a higher power level—and the meters read higher. Of course, if you optimize your microphone for your voice, you might at the same time degrade it for another person.

Meter movements have natural inertia plus deliberately introduced damping to prevent overshoot. This increases the time necessary for the needle to respond to applied energy and will cause deceptively low readings as a result of bursts of short duration. Meters used in broadcasting are made to close tolerances of inertia, damping, response time, etc., as their characteristics are specified by FCC rules. Meters used in amateur equipment show rather wide variations from one unit to another due to manufacturing tolerances, but they are also less expensive.

The frequency distribution of one's voice and the fact that meters respond less to energy of short duration is mentioned because different voices, each reaching the same peak level, will give different readings. As meters respond better to energy of longer duration and the low-frequency cutoff of the many makes of s.s.b. transmitters varies widely, the variation from one unit to another in transmitters of the same make and model probably is greater than many realize. If one transmitter passes energy down to 100 cycles and another to 500 cycles, the meters on the first transmitter will read much higher if both are transmitting the same peak power. The frequency response of the microphone contributes to this significantly, too.

From the foregoing we may conclude that how high the meter on your s.s.b. transmitter will read when you are speaking depends upon:

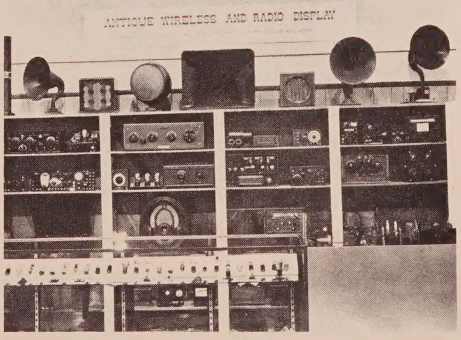
1. The frequency-distribution of energy in your voice.
2. The peak-to-average ratio of your voice.
3. The symmetry of your voice energy.
4. The chance phase relationship between your voice and the phase of the envelope driving the final grids (from which a.l.c. is derived) in your transmitter.
5. The frequency response of your microphone.
6. The audio bandpass of your particular transmiter.
7. The time constant and damping characteristics if the meter that happened to be installed in your unit.
8. And, perhaps, the time-constant determining components in the a.l.c. circuit of your transmitter.

The information provided so far points to the conclusion that the plate current meter (or r.f. wattmeter or r.f. ammeter) doesn't tell you very much about how your transmitter really is operating, and this is correct.

[*Continued on page 92*]

Antique Wireless And Radio Display

A FINE exhibit of antique wireless and radio equipment is on display at the Aero-Space Museum, Balboa Park, San Diego, California. The members of the San Diego Chapter of QSWA, under the direction of Jim Barth, W6KCO, have installed this unique display which should be of interest to the general public and educational for the many school children who visit this fine museum. Things of interest include a display of early radio tubes from land, sea, and aircraft equipment and a model 1920 wireless station. ■

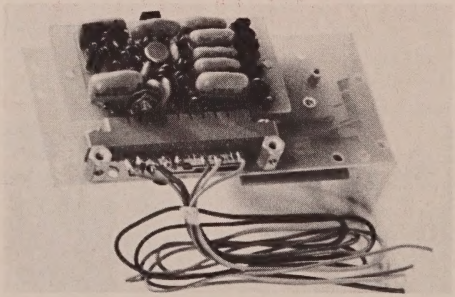


New Amateur Products

HOLD
IN
OUT
ON
Model AL-4
The SCREAMER

Interguard Corporation

INTERGUARD Corp. is now marketing a residential alarm called "The Screamer." It offers open door protection and security against 3-way intrusion. At home, when the door is forced, a piercing horn is activated. When you are away, the alarm will activate within 15 seconds and echo through an apartment building or neighborhood upon intrusion. A key must then be used to deactivate the alarm. When answering the door a momentary pushbutton can be held which when released will activate the alarm. It is self-contained and self-powered, and features easy installation. For full particulars write to: Interguard Corporation, 434 Ave. of the Americas, N.Y., N.Y. 10011 or circle 84 on the Reader Service coupon.

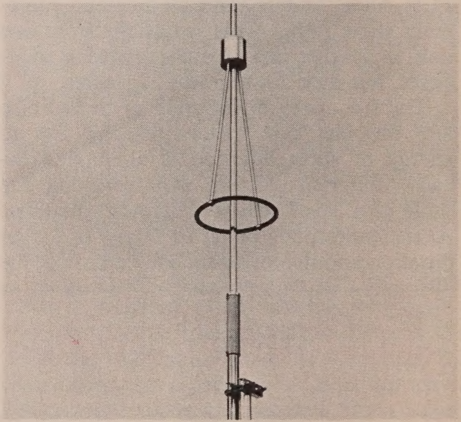


Alpha Electronic Services

THE addition of sub-audible continuous tone squelch to the Motorola Motrac series of radios has been made easy by the new Alpha MK-21 Motrac tone mounting kit. Utilizing the MK-21 makes possible rapid field conversion of previously non-toned Motrac radio units. For detailed information write to: Alpha Electronic Services, Inc., 8431 Monroe Ave., Stanton, California 90680 or circle 85 on the Reader Service coupon.

Mosley Electronics

AN all new mobile antenna system called the "Rode-Master" is being announced by Mosley Electronics. Five new interchangeable coils for 10, 15, 20, 40, & 75/80 plus a six meter antenna comprise the system which has a power rating of 200 watts on a.m. and 400 watts p.e.p. The system also features the Mosley guarantee of an adjustable v.s.w.r. of 1.5/1 or better at any given frequency on each band. Full mounting options are available. For a complete data sheet showing all the Rode-Master features write to: Mosley Electronics, 4610 N. Lindbergh Blvd., Bridgeton, Missouri 63044 or circle 86 on the Reader Service coupon.



Avanti R & D, Inc.

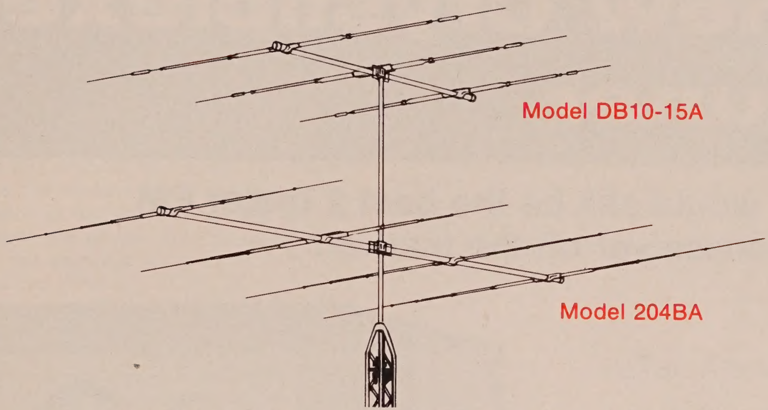
AVANTI announces their Model ARD-257 omnidirectional 2-meter f.m. antenna. The patented tapered skirt configuration is reported to give 4.17 db gain (measured over a 1/4 wave ground plane) plus a low angle of radiation that has proven effective in eliminating dead spots. All aircraft quality aluminum and fiberglass are used in construction. The antenna sells for $44.95. For more information write to: Avanti Research & Development, Inc., 33-35 W. Fullerton Ave., Addison, Illinois 60101 or circle 87 on the Reader Service coupon.

The most powerful antennas under the sun!

hy-gain

MODEL DB10-15A

Gives the 10 and 15 Meter Bands a Real Working Over



Equipped with exclusive Hy-Gain Hy-Q traps, the Model DB10-15A antenna delivers uncompromising performance on both 10 and 15 meters, both stateside and DX.

- 8.4db gain on 10 meters
- 8.3db gain in 15 meters
- F/B ratio 15db to 25db
- SWR less than 2:1
- Takes maximum legal power
- Heavy gauge 13′ boom
- Longest element 23′
- Turning radius 13.5′
- Easily installed in minimum space

Order No. 330 Ham Net $109.95

For Tri-Band Operation, Add the Model 204BA

A tiger on 20 meters, easily installed on same tower with Model DB10-15A.

- 10db forward gain
- Up to 28db F/B ratio
- SWR less than 1.5:1
- Maximum power input 1 kw, AM
- Four full spaced elements on 26′ boom; longest element 36′6″

Order No. 394 Ham Net $149.95

See the best dealer under the sun—the one who handles all Hy-Gain products.

HY-GAIN ELECTRONICS CORPORATION
P.O. Box 5407-FF, Lincoln, Nebraska 68505

even if *Clegg's* new FM-27 didn't have the fantastic new Crystiplexer tuner

it would still be the best 2 meter FM transceiver on the market!

WANTA LISTEN
ON '"76"?
JUST
SWITCH TO ⑦
AND ⑥

Clegg FM 27
SQUELCH
VOLUME
SPOT
TRANSMIT CHANNEL
RECEIVER CHANNEL
MIC

WHAT *IS* A "CRYSTIPLEXER TUNER"?

IT'S *Clegg's* NEW SYNTHESIZING SYSTEM.

WHAT DOES IT DO FOR THE FM-27?

IT PROVIDES INSTANT, PRECISE DIRECT-READOUT SELECTION OF 200 RECEIVE CHANNELS — WITH NO CRYSTALS TO BUY!

WHAT ARE SOME OF THE OTHER FM-27 FEATURES?

ALL SOLID STATE • EXTREMELY COMPACT • 22 WATTS OUTPUT • BUILT-IN 4½ INCH SPEAKER PROVIDES SUPERB AUDIO • DISCRIMINATOR METER • .25 μV SENSITIVITY • SPEECH PROCESSING • RUGGED • RELIABLE • 10 INDEPENDENT TRANSMIT CHANNELS • MOBILE MOUNT

DIMENSIONS — 3½″ H x 7⅝″ W x 9″ D.

e.t. Clegg associates, inc.

LITTELL RD., EAST HANOVER, N. J. 07936
PHONE: (201) 887-4940

F.M.

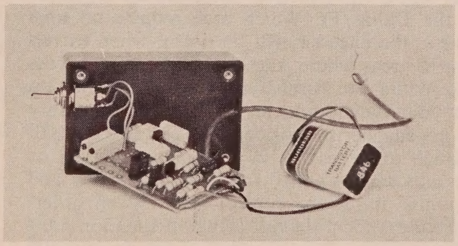
BY GLEN E. ZOOK,* K9STH/5

THE growth of f.m. repeaters on both six and two meters is beginning to present a problem in another related band, the 420-450 mc band. Why? This is where most control links and supervisory controls are located. Also, with the splitting of the 450-470 mc commercial frequencies, much equipment is becoming available for mobile and repeater use on the 420-450 mc band. Thus, the squeeze is on. The best way to prevent chaos in the future is to plan now for the intelligent use of the 420-450 mc band. A pioneer in this planning is the Texas VHF FM Society. At the February 27-28, 1971, meeting in San Antonio the Society adopted a plan proposed by the North Texas Repeater Association to coordinate the use of channels in the 420-450 mc range. Many amateurs appear not to be aware that there is a commercial band just below the 3/4 meter band. This band is from 406 to 420 mc and is used primarily by the United States Government and its various agencies. The equipment used down there is exactly its 450-470 counterpart except for the frequency covered. This equipment is not quite as common as the 450-470 mc equipment, but the demand is small and thus the price remains down. Spectronics (Art Householder) in Chicago has equipment in this range and I believe that Mann on the West Coast also has such items for sale. The other f.m. surplus houses may also have equipment built for the 406-420 mc range. The reasoning for the acquisition of the 406-420 mc equipment is to place the repeater audio links and primary control links down in the relatively unused part of the band. Also, since equipment for this part of the band is not as readily accessible as for the high end, there is less chance of unauthorized use of control frequencies. However, there is sufficient equipment to provide the required control stations and link stations with all that is needed. The Texas plan is relatively simple: Audio and control links are between 420 and 431 mc; a.m., c.w., s.s.b., etc. are between 431 and 438.2 mc; ATV video sidebands of major intensity are between 438.2 and 441.8 mc (center frequency 440.0 mc); and general f.m. from 442 to 450 mc. Since the ATV audio channel appears at 444.5 mc, this channel is not paired for repeater operation. Of course some areas use other frequencies for ATV, but the basic plan could be changed in these areas outside Texas. The nutshell consolidation of the Texas plan is as follows:

Frequency	**Use**
420-422 mc	Intercity repeater links
422-425 mc	Local repeater audio links
425-427 mc	Intercity repeater links
427-429 mc	Local repeater audio links
429-431 mc	Primary repeater control links
431-438 mc	General amateur use excepting f.m
438-442 mc	ATV sidebands
442-445 mc	f.m. repeater outputs
445-447 mc	Direct f.m. frequencies
447-450 mc	f.m. repeater inputs

As stated before, the ATV audio frequency of 444.5 mc is not paired for repeater operation. The frequency 449.5 mc is suggested as a direct and DX frequency. The u.h.f. repeaters follow commercial policies of using high side in and low side out with 5 mc spacing. The original channel spacing is 100 kc starting at 449.900 mc down and with a future of 50 and 25 kc channel spacing as used in commercial applications. 449.1 is the primary repeater input channel with 444.1 mc as the output frequency. The secondary repeater pair is 449.0/444.0 mc and the terciary repeater pair is 449.2/444.2 mc.

The reason for presenting the Texas VHF FM Society plan is to awaken f.m.'ers to the possibility of chaos on 450. Ten years ago no one suspected the rapid growth and crowding on two meters. Fortunately, early f.m.'ers agreed on 60 kc channels (now 30 kc with narrowband) and, for the most part, two meter repeaters follow some sort of channelization. The two meter trend is towards 600 kc channel spacing for input and output, and a similar plan need be adopted for 450. Commercial standards for which the majority of equipment used on 420-450 mc was designed is 50 kc channel spacing. Thus, the possibility of adapting commercial standards as done by the Texas VHF FM Society.



An inside view of the Ross & White TE-2 single-tone encoder. The size of the unit can be judged by comparison to the 9 volt transistor radio battery.

---

*818 Brentwood Lane, Richardson, Texas 75080

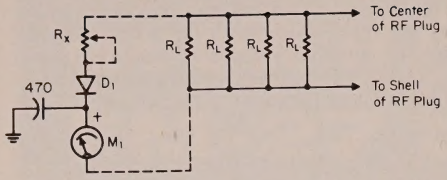


Fig. 1—Schematic for a suitable dummy load. Enclose the load in a mini-box. Metering of the dummy load is shown but is an optional feature.

D_1—Germanium small signal diode. (1N34A suitable.

M_1—0-1 ma maximum, 0-50 μa preferable.

R_1—See text for computation and formula.

Rx—Adjust for desired meter deflection (may be carbon potentiometer).

Equipment Review

The accessory items now available to the amateur f.m. operator are numerous, with many more to come. The mini-review for this month is the single-tone encoders manufactured by Ross and White Electronics Company. Two models of the tone encoder are available. The first model is the TE-2 which has a choice of two tone frequencies and the second model is the TE-5 which has a choice of five tone frequencies. Both models have an internal 9 volt transistor radio type battery for power, thus allowing use with any of the various rigs in use. Basic construction is all solid-state on G-10 epoxy board material. Tone frequencies from 1600 to 2800 c.p.s. with a duration of 0.4 seconds (nominal). The output is sine wave and provision is made to match low, medium, and high impedance audio lines. The case is made from moulded high-impact plastic and is about 3¼″ × 2″ × 1¼″ (these measurements made with my ruler, so are ±1/8″ or so). The TE-2 unit was tested with tones of 1800 and 2100 c.p.s. Output was well within the 2% tolerance on frequency. Construction was good, although some resin residue was on the board. Operation was simple and effective. Although the repeaters in the Dallas/Ft. Worth area require no tone access, the encoder will be useful when travelling in areas where tone burst is required. Ross and White can furnish connection information for your individual f.m. unit, so the versatility of the encoder is considerable. The size is small enough to be used with portable equipment or the guts can be pulled from the plastic box and mounted inside the control head. When ordering either model the following information must be supplied: Model desired; Tone frequencies (may be reset in field); and make and model of f.m. unit with which encoder is to be used. The price of the 2 tone TE-2 is $39.95 postpaid and the 5 tone TE-5 is $49.95 postpaid from the manufacturer, Ross and White Company, 50 West Dundee Road, Wheeling, Illinois 60090. Tell them *CQ* sent you.

Technical Talk

Up to now the Technical Talk section has been directed at the establishment of a local repeater and its associated controls. Although this was interesting to many f.m.'ers it probably was only of passing interest to the non repeater owner. Thus this month and the next several months will deal with a phase of f.m. necessary to everyone: Namely, test equipment and how to use it.

As this is being typed some f.m. amateur is repeatedly keying the Ft. Worth .34/.94 repeater. Why? He is not using dummy load for tuneup and is rapidly losing friends. Situations like this are often the rule rather than the exception. Some amateurs do not care if they interfere with other stations. Still others either do not have need of a dummy load enough to justify the purchase of a commercial unit. Still others don't realize that a light bulb not only does not present a 50 ohm load at two meters or higher but makes a fair antenna. Thus, the first half of the *Technical Talk* will cover the building of a suitable dummy load.

Most f.m. units now in use fall into the 10 to 25 watt output class. A suitable load for these units can be constructed from ordinary 2 watt carbon resistors in parallel. This load resistor can then be enclosed in a small mini-box (with a few ventilation holes drilled) to prevent radiation. This idea is not new. Similar loads have been presented at various times in all the amateur magazines and handbooks, but they require repeating. Provision can be made to tap off a relative output indication for readout on a meter movement. The value of resistor to use can be calculated by dividing the power output of the transmitter by 2 and multiplying by 50 ohms. The number of resistors required is the result of dividing the power by 2. For example, if the power output were 10 watts, the required number of resistors at 2 watts required would be 5. Multiplying 5 × 50=250 ohms. The nearest value to this normally available would be 270 ohms. The resultant load would be 270/5 or 54 ohms. This is well within 10% of the desired 50 ohm load and is probably closer than your antenna. Sketches of physical layout and schematics appear as figures 1 and 2. For greater power dissipation the load resistor can be placed in a container with light oil such as transformer oil. A short term substitute would be cooking oil, but it is much inferior. Do not use motor oil.

The second test item is a d.c. source for checking out mobile units. Several amateurs have written for such information and the schematic in figure 3 has been sent to them. The power supply is not regulated, but will function well over a fairly large current range. No specific transformer or current rating is called out. The larger the transformer rating the greater the current which can be pulled from it. When servicing primary transistorized equipment the output voltage must be prevented from going too high. This can be accomplished by placing a load to draw approximately 1 amp across the output. This load may be built into the unit. When servicing tube type equipment the filament drain will keep the output voltage from going too high. This supply is basic and the voltage will vary from about 15 volts down to 12.5 volts at maximum current rating of the transformer used. This is in the range of the voltage in the usual automobile. The higher the current rating of the transformer, the less the voltage drop. No specific part numbers are called out. Silicon rectifiers and bridge assemblies are available from both new and surplus sources as are suitable transformers and capacitors. By the way, the more capacitance the better. The basic schematic appears as figure 3.

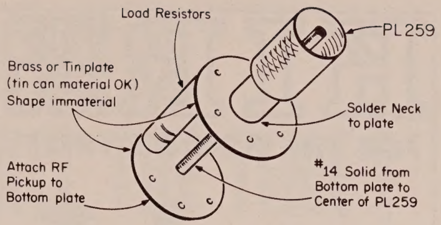


Fig. 2—Basic construction of the dummy load. The shape of the termination plates is immaterial. For best results enclose the dummy load in a mini-box or other shielded enclosure.

Canadian Repeaters

As summer approaches, many amateurs will be heading into the northern parts of the United States, and even into Canada. Believe it or not, there is extensive f.m. activity north of the border. Remember that when travelling in Canada that prior permission for operation must be obtained from the Canadian Government. Thanks to W5HS/VE3, one of my amateur friends who has been on assignment in Toronto for several months, a list of Canadian repeaters has been obtained. Most of these repeaters are operational at the time of this writing. Those repeaters which are proposed but not operational are marked (*).

Location	**Call**	**Input**	**Output**
Atlantic Provinces			
St. John's Nfld.	VO1GT	146.46	146.94
Sydney, N.S.	VE1JD	146.46	146.94
Truro, N.S.	VE1XK	146.46	146.94
Halifax, N.S.	VE1ARC	146.46	146.94
Moncton, N.B.	VE1VHF	146.46	146.94
St. John, N.B.	VE1KI	146.46	146.94
Quebec			
Matane	VE2CSL	146.46	146.94
Riviere-du-Loup	VE2NY	146.46	146.94
Chicoutimi	VE2CRS	146.46	146.94
Quebec City	VE2OM	146.46	146.94
Quebec City	VE2VD	146.52	147.50
Trois Rivieres	VE2AT	146.46	146.94
Sherbrooke	VE2FZ	146.46	146.94
Montreal	VE2CAT	146.18	146.64
Montreal	VE2CLA	146.10	147.30
Montreal	VE2MT	146.46	147.06
Montreal	VE2PY	146.28	146.88
Montreal	VE2RM	146.40	147.18
Montreal	VE2TA	146.52	147.50
Montreal	VE2XW	146.70	147.60
Ontario			
Ottawa	VE3CRA	146.46	146.94
Renfrew	VE3STP	146.34	147.06
Kingston	VE3KBR	146.46	146.94
Peterboro	VE3PBO	146.34	146.94
Oshawa	VE3OSH	146.40	147.12
Toronto	VE3MOT	146.58	147.18
Toronto	VE3RPT	146.46	146.94
Toronto	VE3SIX	52.76	52.525
St. Catherines	VE3NRS	146.22	147.24
Grimsby	VE3LCR	146.49	147.09
Hamilton	VE3DRW	146.16	146.76
Kitchener	VE3KSR	146.34	146.94
Kitchener	VE3KSR	146.37	146.97
London	VE3LAC	146.46	147.06
New Liskeard	*	146.46	146.94
Sudbury	VE3SRS	146.46	146.94
Sault Ste. Marie	VE3SSM	146.46	146.94
Sault Ste. Marie	VE3SSM	146.34	146.94
Thunder Bay	*	146.46	146.94
Orilla	*	146.34	146.94
Western Provinces			
Winnipeg, Man.	VE4XK	146.46	146.94
Brandon, Man.	*	146.34	146.94
Regina, Sask.	VE5SS	146.46	147.33
Calgary, Alta.	VE6AUY	146.46	147.00
Edmonton, Alta.	VE6WO	146.46	147.33
Cranbrook, B.C.	VE7CAP	146.46	147.33
Nelson, B.C.	VE7BTU	146.46	147.33
Vancouver, B.C.	VE7BUZ	146.34	146.94

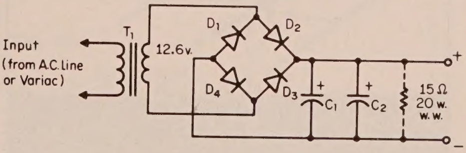
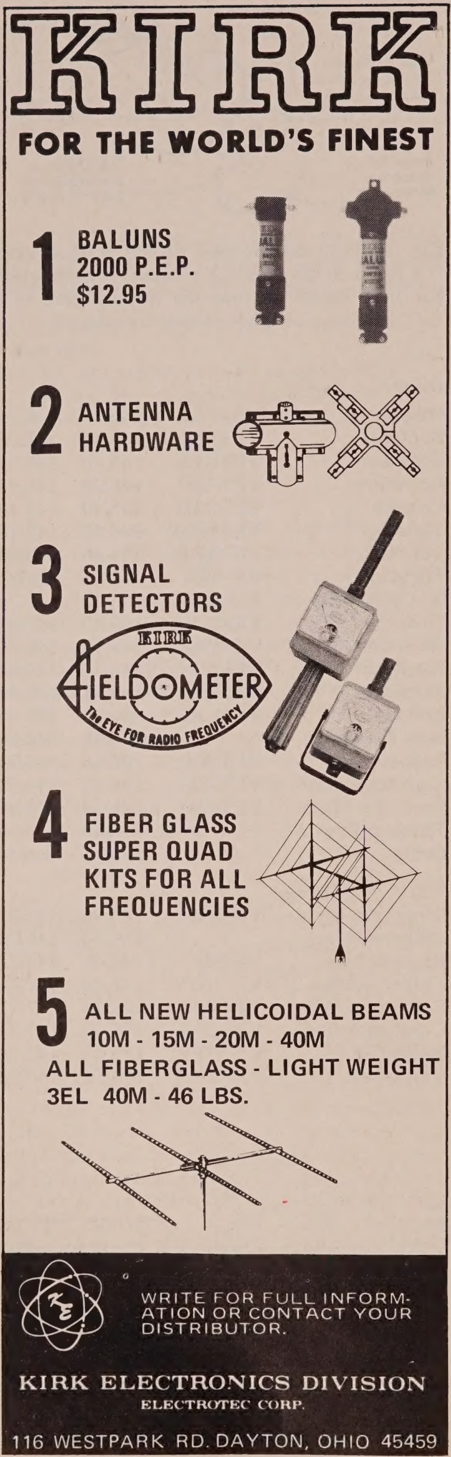


Fig. 3—A basic bench type d.c. power supply. For best results, control the input voltage with a variac or solid state device.

C_1, C_2—12,500 mf, 15 v.d.c. (or larger).
D_1, D_2, D_3, D_4—50 p.i.v. at desired current.



KIRK

FOR THE WORLD'S FINEST

1 BALUNS
2000 P.E.P.
$12.95

2 ANTENNA
HARDWARE

3 SIGNAL
DETECTORS

KIRK FIELDOMETER The EYE FOR RADIO FREQUENCY

4 FIBER GLASS
SUPER QUAD
KITS FOR ALL
FREQUENCIES

5 ALL NEW HELICOIDAL BEAMS
10M - 15M - 20M - 40M
ALL FIBERGLASS - LIGHT WEIGHT
3EL 40M - 46 LBS.

WRITE FOR FULL INFORMATION OR CONTACT YOUR DISTRIBUTOR.

KIRK ELECTRONICS DIVISION
ELECTROTEC CORP.
116 WESTPARK RD. DAYTON, OHIO 45459

Vancouver, B.C.	VE7ACS	147.33	146.58
Prince George, B.C.	?	146.58	147.33

As can be seen the f.m. activity in Canada is growing about as fast as in the United States. This is the type of information which I need to keep you, the f.m. minded amateur, up-to-date in the f.m. world. How about it.

Q & A

Q. Will you send me a copy of the manual for a Motorola T43GGV?

A. This is typical of several requests for complete manuals on obsolete f.m. equipment. First of all, the manuals on most tube-type f.m. equipment now being used by amateur f.m.'s have been out-of-print for five to ten years. Thus, they are no longer available either from the manufacturer or from other sources. The expense of reproducing a manual by Xerox or similar is prohibitive in both out-of-pocket expense and time required. The vast majority of obsolete equipment now in use was manufactured by either Motorola or General Electric. Within the various models there are many variations (over 50 in the T43 series) with a book to go with each. Thus, it is a practical impossibility to retain information on all possible variations. However, most amateurs can work from a similar-to the desired schematic. As a result, there are two sources of information available. The first is the *Motorola FM Schematic Digest* available from S. Wolf, 1100 Tremont Street, Boston, Mass., and the *G.E. Schematic Digests* available from Gregory Electronics Corp. 249 Route 46, Saddle Brook, N.J. Gregory also stocks the *Motorola Digest,* as does Mann, Spectronics, and others. I will usually refer all requests for information on Motorola and General Electric equipment to these sources. Thus, one can save time by going to the proper source first.

Q. What are the normal tone-burst frequencies?

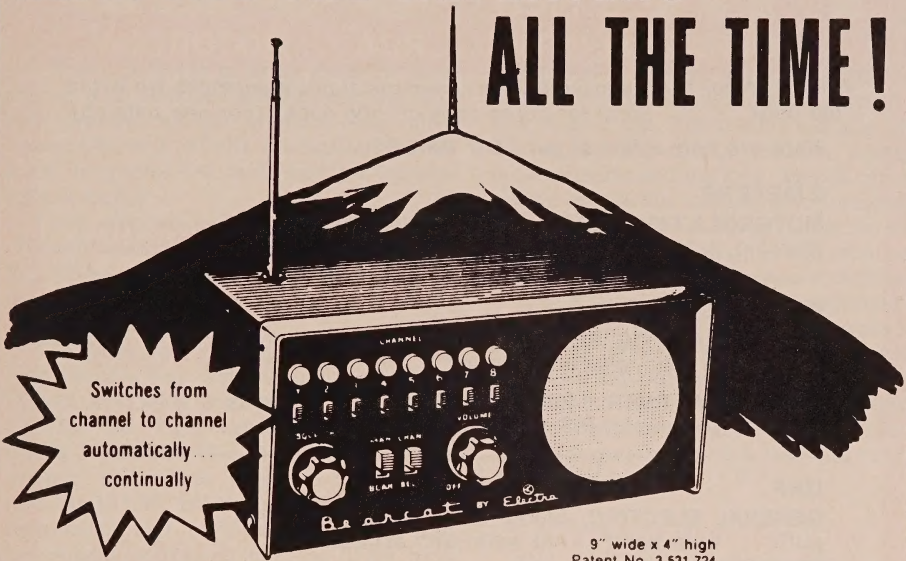
A. The tone-burst or single-tone frequencies commonly in use start at 1800 c.p.s. and proceed each 150 c.p.s. up to 3000 c.p.s. (maximum tone frequency allowed by FCC regulations). For example tone frequencies run 1800, 1950, 2100 c.p.s. and up.

Q. What are the advantages of tone-burst or "whistle-on" repeaters?

A. Tone controlled access repeaters are most effectively used in two specific cases. The first case is when the repeater owners desire to retain a closed (not open for general use) repeater. The second case is for use in areas where two or more repeaters have a common input frequency

[*Continued on page 100*]

HEAR ALL THE REPEATERS
ALL THE TIME!


Switches from channel to channel automatically... continually
CHANNEL
1
2
3
4
5
6
7
8
SQUELCH
MAN CHAN
SCAN SEL
VOLUME
OFF
Bearcat BY Electra

9" wide x 4" high
Patent No. 3,531,724

on the Electra BEARCAT

FIRST AND FINEST

Scanning Monitor Receiver

Continuously scans from 1 to 8 FM channels you select.
You can hear the local repeaters
As well as

POLICE • SHERIFF • WEATHER • CIVIL DEFENSE
FIRE • BUSINESS • UTILITY • MARINE • ETC.

The Bearcat takes you where the action is! Just turn it on and it searches for the first active channel . . . stops for any transmission . . . then resumes search. Red lights flash as channels are scanned . . . steady light indicates active channel. Switches let you select channels of greatest interest. Transistorized circuitry with plug-in crystals. Front-mounted speaker makes it ideal for table, desk, bedside, car or boat. U.S. made. Full one-year warranty. Get the original. Get the Bearcat.

AM Aircraft Band Model Also Available

FROM **$139.95** PLUS CRYSTALS @ **$5.00** EACH

AT BETTER DEALERS EVERYWHERE

ELECTRA CORPORATION • CUMBERLAND IND 46229

FM 2 Meter UHF 6 Meter USED

GENERAL ELECTRIC . . . RCA . . . MOTOROLA

When it comes to great used mobile communications equipment, we wrote "the book" . . . Send for a free copy of "the book" (our new catalog).

Here are only a few of our LOW PRICES:

2 METERS

MOTOROLA T43G SERIES. Receiver W. B. 30 watts. 10" Housing. 6/12 volts plus *accessories . . . checked out* .. **$98.00**

---

6 METERS

MOTOROLA. T51G SERIES. Wide Band Receiver. 60 watts. 6/12 volts, *plus accessories . . . checked out* **$98.00**

MOTOROLA. FMTR 140D. Wide Band 6 or 12 volts. 60 watts. Dynamotor P.S. *Complete accessories* **$48.00**

UHF

GENERAL ELECTRIC. Model EG48S Accents cream puffs . . . wide band . . . 10 watts *with accessories . . . checked out* **$108.00**

GENERAL ELECTRIC. MT42 Transistorized Power Supply . . . 15 watts . . . clean . . . checked out . . . *complete accessories* **$138.00**

GENERAL ELECTRIC. MAE42. Vibrator power supply 15 watts . . . *plus accessories . . . checked out* **$98.00**

Note: We have expanded our warehouse to double its capacity. We can now stock a larger and more varied line of equipment. Should you be in our area (15 minutes from N.Y.C.) you are cordially invited in to browse. We now have the warehouse space to carry 15,000 pieces of used FM Mobile Communication Units.

For Your Convenience **SCHEMATIC DIGESTS.** (Post Paid)

G.E. SCHEMATIC OUTLINE AND INTERCONNECTION DIAGRAMS FOR GE 2-WAY FM RADIOS.

Vol. 1 Pre-Progress Line ('49 - '55) 25-50 MHz 72-76 MHz

Vol. 2 Pre-Progress Line ('49 - '55)

150-170, 405-425 MHz, 450-570 MHz .... each volume **$4.50**

MOTOROLA FM SCHEMATIC DIGEST

revised edition to 1960 .... **$6.50**

GREGORY ELECTRONICS corp

GREGORY ELECTRONICS CORP.

The FM Used Equipment People

249 Route 46, Saddle Brook, N. J. 07662

Phone (201) 489-9000

Dept. CQ

Late Amateur Satellite News

BY GEORGE JACOBS,* W3ASK

STEADY progress is being made in completing what is hoped will become the next radio amateur satellite in space. Now called AMSAT OSCAR-B (AO-B), the satellite will become designated OSCAR-6 once it is successfully launched.

Three separate repeaters, built by groups of radio amateurs in Australia, Europe and the USA, are nearing completion. Two of these repeaters will be selected to fly in the AO-B satellite.

The Australian project is a four-channel, hard limiting f.m. repeater designed by the Project AUSTRALIS team which was responsible for the highly successful AUSTRALIS OSCAR-5 satellite. This repeater will receive discrete frequencies in the 2-meter band (145.80, 145.85, 145.90 and 145.95 mc), and remodulate and retransmit them on four corresponding frequencies in the 70 cm. band (432.20, 432.25, 432.30 and 432.35 mc). The power output of each channel will be approximately one watt.

A EURO-OSCAR repeater, a project initiated under the auspices of Region I of the International Amateur Radio Union is also nearing completion. This will be a ten watt (p.e.p.) linear repeater, with a bandwidth of approximately 50 kc. It will be capable of receiving signals in a segment of the 70 cm. band, centered on a frequency of approximately 432.15 mc and relay them in the 2-meter band, centered on a frequency of 145.95 mc. The repeater is designed for use with s.s.b., c.w., f.m., f.s.k. and amateur television transmissions.

A third repeater is ready for testing in the USA which was designed and constructed by members of the Radio Amateur Satellite Corp. (AMSAT). This two watt (p.e.p.) linear repeater will have the capability of receiving signals in a segment of the 2 meter approximately 100 kc wide centered on 145.95 mc), and relay them in a similar segment in the 10 meter band, centered on a frequency of approximately 29.5 mc. This repeater will be capable of relaying any type of modulation permitted in these two bands.

The AO-B satellite will be solar powered, and it is being designed to have a useful life of at least a year. The satellite will also transmit signals that will be used for telemetry measurements and tracking. Special circuitry aboard the satellite will enable its transmitters to be controlled from the ground in the event it becomes necessary to shut them off in order to conserve power or eliminate interference.

NASA has already agreed to undertake the launch of the next OSCAR satellite when it is completed. While no launch date has yet been set, AO-B will ride as a secondary payload as soon as the required extra weight capacity can be found on a suitable primary mission. A launch may be possible later this year, or during early 1972.

Flyover to Mark Special Day

This June issue of *CQ* should be in the hands of most of its readers in time to note an important day and an accompanying amateur satellite event which will take place during mid-May.

Monday, May 17 will be noted throughout most of the world as *World Telecommunication Day*. This day is now set aside each year to honor the birthdate (in 1865) of the International Telecommunication Union, and to make the general public aware of the importance of telecommunications in everyday life. The theme for this year's Day is Space and Telecommunications.

One of the activities marking this event in the USA will be the flight-testing of an AO-B repeater, under simulated space conditions, from an aircraft flying over the eastern third of the country. The flight will take place over the weekend of May 15-16, weather permitting.

Since the AMSAT 2-to-10 meter repeater is the most readily available, it has been chosen for this flight. The aircraft will fly at altitudes up to about 11,000 feet. At this altitude the radio horizon should be about 150 miles, allowing communication through the repeater between stations as much as 300 miles apart. Since there is the possibility that the 10 meter down-link signal may also be propagated by the ionosphere, signals from

---

*Space Communications Editor, *CQ*, 11307 Clara Street, Silver Spring, Md. 20902.

the repeater may be received over much greater distances.

Plans call for the flight to begin Saturday morning, May 15 from Baltimore. The aircraft will fly north to Boston (at a ground speed of approximately 120 m.p.h.), and then west in the direction of Chicago. The plane will land at 1800 EDT (probably before it reaches Chicago), and continue on to Chicago and back to Baltimore on Sunday, May 16.

The repeater aboard the aircraft will be fitted with approximate attenuators so that its operation will simulate the signal levels that will actually be encountered at an orbital altitude of 1,000 miles. An omni-directional monopole antenna will be used to receive 2 meter signals from the ground, while a long-wire antenna on the aircraft will be used for the 10 meter down-link. This means that signals from the repeater will be received strongest in directions at right angles to the flight path.

The aircraft will maintain periodic communications with selected amateur stations along its route on a frequency of 146.85 mc (f.m.). Reports of the aircraft's location and other information will be relayed during the day on 7225 kc, with WA1IOX acting as net control. After 1900 EDT on Saturday and Sunday evenings the net will operate on 3855 kc. Check these frequencies for the latest information concerning the flight, especially if there might be delays or cancellation due to bad weather.

The FCC has granted the necessary waivers so that Technician and Novice Class licensees can also participate in this operating activity. Waivers were required since 2 meter signals will be repeater in the 10 meter band.

Operating Suggestions

Here are some suggestions that may help in establishing two-way communication through the airborne AO-B repeater.

The repeater *inverts* incoming and out outgoing signals. This won't bother a.m., c.w. or f.m. reception, but u.s.b. signals received by the repeater will be retransmitted as l.s.b., and the mark-space of f.s.k. signals will be inverted. This also means than an incoming signal "x" kc *higher* than the 2 meter center frequency of 145.95 mc will end up as an output signal "x" kc *lower* than the 10 meter center frequency of 29.50 mc. For example, if a station calls CQ on 145.980 mc (center frequency *plus* 30 kc), he will be heard on 29.470 mc (center frequency *minus* 30 kc).

The approach of the aircraft can be checked by listening for the repeater's beacon transmitter on 29.45 mc. The transmitter will be sending HI or three digit numbers in Morse Code to simulate the AO-B telemetry system.

The beacon will be interrupted occasionally to identify in a.m. voice with the call WA3NDS, which has been assigned to AMSAT by the FCC. Brief instructions for using the repeater may also be given during these breaks.

The AMSAT repeater is so designed that its power will be divided among all of the signals in its passband. This means that the repeater will be able to handle a much greater number of lower power signals simultaneously than higher power ones. Since effective radiated powers as low as 80 watts (e.g., a transmitter output of 20 watts into an antenna with a gain of 6 db in the direction of the repeater) may block or capture the repeater, it is imperative that e.r.p. be kept within certain limits. AMSAT recommends that the e.r.p. in the direction of the repeater *not exceed 80 watts* when transmitting in the passband between 145.90 and 146.00 mc, and *not exceed 800 watts* in the segments 145.83 to 145.90 and 146.00 to 146.07 mc. Stations exceeding these power levels may prevent other amateurs from simultaneously using the repeater, and they will be easily identifiable as the culprit!

The repeater's beacon signal can be used to insure that a station's power level is not excessive. Before attempting to communicate through the repeater, send a test signal in the appropriate segment of the 2 meter passband. Listen for your own signal retransmitted from the repeater on the appropriate *inverted* 10 meter frequency. Adjust your e.r.p. (by adjusting power output or antenna direction) so that on voice peaks or under key down conditions the strength of your repeated signal is no more than one S-unit, or 6 db, stronger than the level of the beacon signal.

After this adjustment has been made you can be relatively sure that your signal will take no more than its fair share of the repeater's power and you are ready to communicate with little fear of hogging the repeater.

Logs containing the calls of stations

[*Continued on page 98*]

Broadband Antenna For Forty Meters

BY HOWARD PHILLIPS,* WB5ACP

This capacity-loaded antenna is resonant across the entire 40 meter band with an s.w.r. of 1.3:1 or less. Its longest element is less than 3/4 the length required for a standard single wire doublet.

The antenna described here is designed for operation on 40 meters. However, the principles can be used to design a short, broadband antenna for any desired frequency. The operating principle of this single-band broadband antenna is similar to the operation of a multiband multiple doublet. The reason for the "shortness" of this broadband antenna lies in the "capacity hat" effect of the fanned-out ends.

The need for broadbanded radiating systems has increased with the sub-band reapportionment which accompanied incentive licensing. Without a broadband antenna, efficiency is sacrificed on some mode if a combination of phone/c.w./RTTY operation is attempted.

Design

The design of this antenna is based upon the design of a single-wire doublet. For a half-wavelength single wire doublet, the length of a single leg is given as:

$$L\ (\text{feet}) = \frac{234{,}000}{f\ (\text{kc})}$$

where L is the leg length in feet and f is the operating frequency in kc. The change in length required to change the resonant frequency by a given amount is calculated by taking the derivative of the above equation:

$$\frac{dL}{df} = \frac{-234{,}000}{f^2}\ \text{(for any frequency)}$$

If this equation is evaluated at $f = 7200$ kc, we have:

$$\frac{dl}{df} = -.0045\ \text{feet per kc}\ (-.06\ \text{inches per kc})$$

or

$$-.45\ \text{feet per 100 kc}\ (-6\ \text{inches per 100 kc})$$

where the minus sign indicates that an *increase* in antenna leg length decreases the resonant frequency. All the above hanky-panky can be summarized by saying that on 40 meters, if the antenna leg length is changed by 6 inches, the resonant frequency is changed by approximately 100 kc.

The dimensions of the broadband antenna in fig. 1 are chosen so that a pair of legs is resonant every 100 kc from 7.0 mc to 7.3 mc. This requires four pairs of legs. The longest pair is resonant at 7.0 mc and the shortest pair is resonant at 7.3 mc. The operating principle of this single-band broadband antenna is seen to be quite similar to that of a multiple doublet antenna designed to resonate on two or more ham bands. This explains the broadbanded nature of the antenna, but why is this antenna so much shorter than a single-wire doublet?

The fanned-out ends of the antenna enhance two related phenomena: end effect and capacitance loading effect. The two phenomena are present to some extent in all types

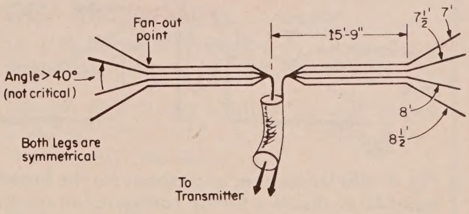


Fig. 1—The forty meter broadband doublet. The length of each half of the unfanned portion of the antenna is 15'9" with the longest half-element length being 24'4".

---

*215 Carlisle N.E. Albuquerque, N.M. 87106

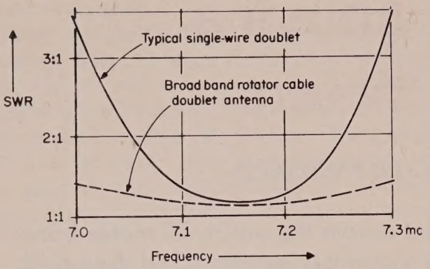


Fig. 2—Measured bandwidth vs. s.w.r. characteristics of the broadband 40 m. antenna and a conventional 40 m. dipole.

of antenna systems. Both effects tend to increase the effective electrical length of an antenna element. Consequently, for any given resonant frequency, the physical length of the antenna must be shortened when the capacitive loading effect is enhanced. For the antenna shown in fig. 1, the fanned-out ends compose a "capacity hat" which significantly reduces the required length of the antenna.

Optimum Bandwidth

For ham operation, it is desirable to have an antenna whose bandwidth covers the entire ham band, but not much more than that. This affords some protection against radiating power outside the band if the transmitter develops any spurious output on frequencies far from the ham band. This situation is achieved by the antenna described by fig. 1. Figure 2 shows a plot of s.w.r. *vs.* frequency for the broadband antenna. The s.w.r. rises sharply outside the 40 meter band, as there are no elements resonant outside the band.

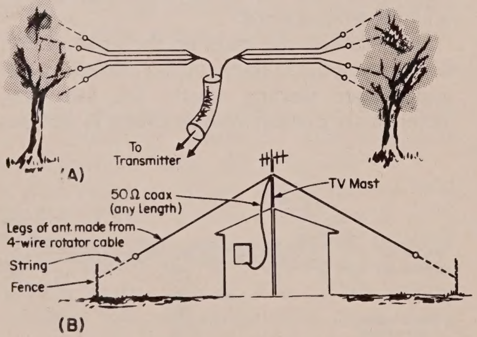


Fig. 3—(A) Using trees as supports for the broadband 40 m. dipole a flattop configuration results. String attached to the ends of the fanned conductors provides convenient insulated support. (B) Supported from the center from a pole or TV mast gives the popular inverted vee configuration.

One by-product advantage of the broadband antenna described here is that since it is resonant across the entire 40 meter band, it is also resonant across the entire 15 meter band (resonant from 21.0 to 21.9 mc). This antenna may be used on 15 meters without the need for antenna switching. It should be noted that since the 15 meter band extends only from 21.0 mc, care must be taken to insure against any spurious output from the transmitter in the range of frequencies from 21.45 mc to 21.9 mc.

Construction

The construction of the broadband 40 m. antenna is illustrated in fig. 1. The length of the longest leg is:

15′9″ + 8′6″ = 24′4″ (length of longest leg).

The length of the longest element (two legs) is forty-eight feet, eight inches, which is considerably shorter than the sixty-six feet required for a standard single-wire doublet for the 40 meter ham band. The antenna is easily constructed using standard 4-wire TV rotator cable.[1] The wires are easily separated and stripped apart in a manner so that the wires remain individually insulated. The fan-out point must be taped to prevent the rotator cable from splitting beyond the fan-out point. The lowest s.w.r. (best impedance match between antenna and transmission line) is obtained if 50 ohm coax is used.

Installation

The antenna can be erected in either a "flat top" or "inverted V" configuration. If desired, a TV mast can be used for a center support (fig. 3A) or, if convenient, the ends may be supported by tree branches as shown in fig. 3B. The leg may be supported by any of the popular methods used for a single-wire doublet (egg insulators with wire, nylon string, etc.) Because of its broadbanded nature, the resonant frequency of this antenna is not affected by surrounding objects as much as single-wire doublet. The resonant frequency and bandwidth are slightly dependent upon the separation angle between the end elements (angle A in fig. 1). However, this angle is not critical provided that it is greater than 40°. Small angles (less than 30°)

---

[1] Archer rotator cable, supplied by Allied Radio Shack; $3.59 per 100 feet.

are not acceptable, since the small separation causes excessive capacitive coupling between the elements, which in turn causes the end elements to be "shorted together" at radio frequencies. The end elements may be fanned out in any geometry—they need not lie in the same plane.

In actual practice, every antenna should be field tuned if maximum performance is required. The resonant frequency of this broadband antenna is not a critical function of length. Consequently, a broadband antenna such as this requires less trimming than a single-wire doublet. However, if trimming is needed, the reduction in length should be made at the center point, for convenience, rather than adjust the lengths of all eight end elements.

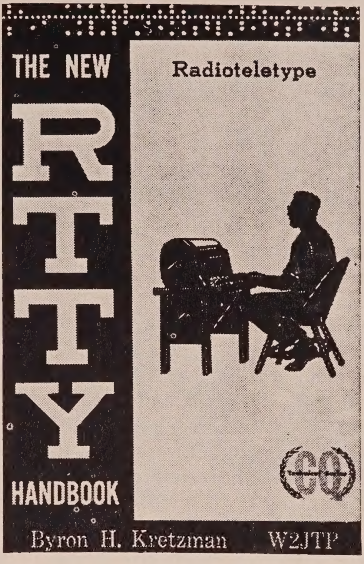
Broadband antenna systems are inherently not critical with respect to their physical dimensions or their surroundings. This can be explained best by considering the effects of height above ground, antenna length, etc., for both a narrowband antenna (such as a single-wire doublet and the broadband antenna. Assuming a 150 kc bandwidth for the narrowband antenna, if the resonant frequency is changed by 100 kc (by a change in height, for example), the operation of the antenna is significantly altered. On the other hand, if the resonant frequency of a broadband antenna (400 kc bandwidth) is shifted by the same amount (100 kc), there is a wide range of frequencies (300 kc) about the resonant frequency for which the operating characteristics remain essentially unchanged. Consequently, the broadband antenna is relatively insensitive to the effects of surrounding objects and to changes in antenna height, humidity, and the fan-out angle.

Performance

As shown in fig. 2, the bandwidth characteristic of the broadband 40 m. antenna compare very favorably to those of a conventional dipole, with s.w.r. being 1.4 to 1 or less over the entire 40 m. band. Performance is comparable to that of a full size dipole or inverted vee and if the multiple supports required for the 8 fanned legs present no problem, the design is ideal for the man who likes to use the whole band. ■

PLEASE USE YOUR ZIP CODE NUMBER ON ALL CORRESPONDENCE

"THE NEW RTTY HANDBOOK"



A treasury of vital and "hard to get" information. Loaded with equipment schematics, adjustment procedures, operating procedures, etc. A valuable asset to both the beginning and the experienced RTTY'er. Special section on getting started, all written by Byron Kretzman, W2JTP, a well known authority in the field. This book is a must for your library! Only $3.95.

*New York State residents Must add sales tax applicable to your area.

CQ Magazine
14 VANDERVENTER AVENUE
PORT WASHINGTON, L.I., N.Y. 11050

SIRS: My check (money order) for $________ is enclosed. Please send ________ copies of the "The New RTTY Handbook.

Name________

Address________

City________State________Zip________

Further Improvements Of The Ham-M Rotator Indicator

BY STUART MEYER,* W2GHK/4

THE article in the December 1970 issue of *CQ* by Gene A. Nurkka, VK9GN, entitled "Improving The Ham-M Rotator Indicator," prompted the writer to do something about a number of minor problems he was experiencing with several Ham-M Rotators at both of his locations.

The variation in calibration with change in power line voltage was disturbing; on the other hand, the environment was nowhere near as bad as that encountered by VK9GN. Accordingly, it was decided to employ a simpler form of regulation, similar to that shown in fig. 2 of the above-referenced article.

Referencing fig. 1 of this article, it can be seen that this simple change is similar to the original proposed regulator, except that the transistor used as a diode is now replaced with two 11-volt, 1-watt Solitron 1R11D or International Rectifier 1ZS11T5 zener diodes in series. The series regulator resistor is now 47 ohms, 1 watt (R_{501} in fig. 1). This results in a regulated 22 volts, with no further voltage regulator modification being required. In order to bring the unit back into correct calibration, it is only necessary to readjust the internal 5K compensating control. The 18K resistor in series with the meter remains in the circuit in its original form. (This results in a more linear calibration with respect to rotator rotation.) Incidentally, the 21-volt d.c. figure referenced in the original article turned out to be more like 26 volts in units the writer checked. After adding regulations, this voltage drops to approximately 22 volts.

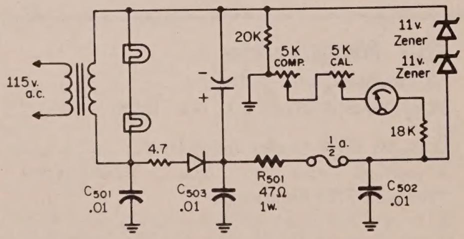


Fig. 1—Circuit of the Ham-M rotator indicator unit showing additional components added to achieve more consistent meter readings and freedom from r.f. interference. New components are shown in heavy lines.

The writer has preferred to have constant direction indication in his control box, and has modified several such units by jumping switch contacts 7 and 8 (as described in the Ham-M manual under the section entitled "Continuous Meter Indication." This worthwhile modification, however, has at times produced other problems. The first of these was encountered when operating in the 75-meter band with a Marconi-type antenna. At times, it is desirable to have the higher frequency equipment in standby condition, with all power ON (including rotator box), while finishing up a contact or schedule on 75 meters. R.f. finding its way into the control box has produced several problems, the first of which was excessively high brilliance of the lamps during periods of transmission. In several instances, the bulbs have burned out due to the addition of the r.f. voltage on top of the normal a.c. voltage normally applied to the lamps. The cure for this is very simple and consists of adding a .01 mf 600-volt ceramic disc capacitor at the 23 v. a.c. feed point to the lamps and the 4.7 ohm resistor. This is shown as C_{501} in fig. 1. The tie point of this connection is nearest the left side lamps (as viewed when the operator is facing the control box in its normal table-top position).

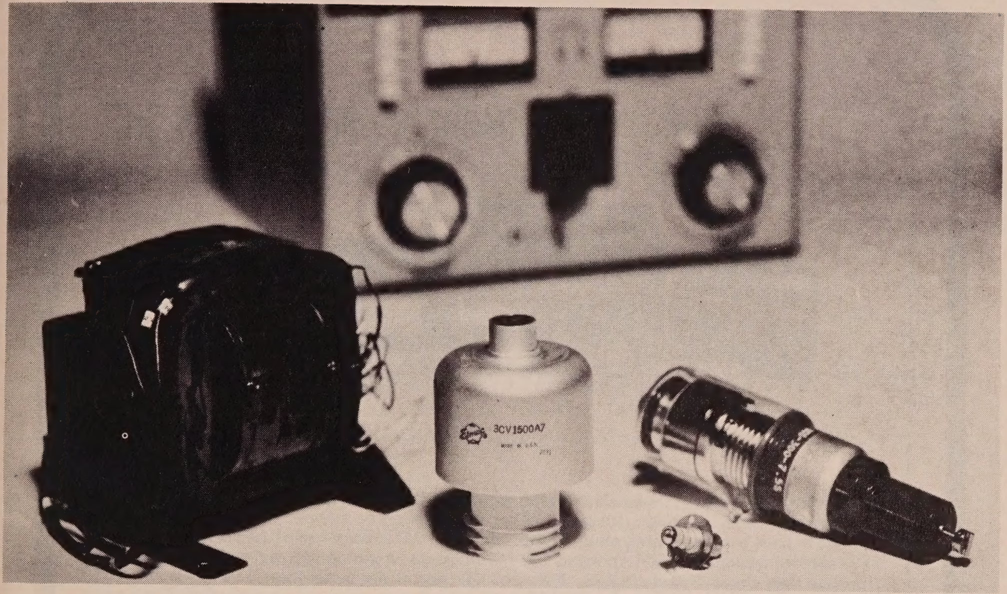
A second problem that has shown up, from time to time, is fluctuating meter readings during periods of transmission. In some instances, the meter would jump around as much as 90° when either using a low-frequency antenna while the higher frequency equipment is in standby condition, or when operating down on the c.w. portion of the higher frequency bands (with beam cut for the phone section) with the standing wave ratios in excess of 2:1. This condition is aggravated when the coax line is run parallel with the control cable between the indicator

[*Continued on page 99*]

---

*4000 Wingate Drive, Raleigh, N.C. 27609

STATE OF THE WATT...



...a la ALPHA SEVENTY

The ALPHA SEVENTY high power linear amplifier incorporates components heretofore available only in equipment designed for military or industrial applications. The result – *a new standard of performance and convenience.*

- EXTRA HEAVY DUTY TRANSFORMER WITH TAPE-WOUND CORE OF GRAIN-ORIENTED SILICON STEEL is 60% smaller and lighter than conventional laminated units.
- VACUUM VARIABLE CAPACITOR combines low minimum and high maximum capacitance, very small size, and excellent flashover resistance.
- VACUUM T/R RELAY is extremely fast, quiet and compact. It closes in milliseconds with a barely audible "tick," handles maximum power with ease.
- CERAMIC-METAL POWER TUBES are rugged and compact. The revolutionary *vapor-cooled* ALPHA SEVENTY delivers *uncompromising maximum legal power in all modes.* It runs *whisper-quiet,* thanks to the Eimac 3CV1500A7 shown above and ETO's integram recirculating heat exchanger system. The ALPHA SEVENTY is also available with a 3CX1000A7 tube in a thermostat-controlled air cooling system. The two models are otherwise electrically and mechanically identical.

The ALPHA SEVENTY ... Air-cooled model PA70-A $1595 / Vapor cooled model PA70-V $1775

AMRAD SUPPLY

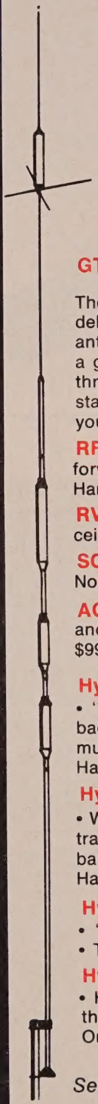
Central California's Most Complete Amateur Radio Shop. See AMRAD for the Finest in Service, Equipment and Supplies.

1025 Harrison St. Oakland, California 94607 Phone 415/451-7755

The most powerful signals under the sun!

THE GALAXY 550A

MORE POWER, MORE FLEXIBILITY FOR THE Fixed Station...



GALAXY
GALAXY GT 550A
GALAXY
GALAXY

GT-550A Transceiver Order No. 800 Ham Net $550.00

The GT-550A is the best transceiver on the market for the money. Bar none. Costs just $550 and delivers 550 watts of power. Operating either fixed station or mobile, this transceiver is guaranteed to have a top frequency stability after warm-up. We're so proud of the stability we include a graph with each GT-550A showing the purchaser how stable his radio was when it went through final check. 550 watts SSB; 360 watts CW; sensitivity better than .5 uv for 10db S+N/N; stable—45db carrier suppression; 25 KHz calibrator and vox option; no frequency jump when you switch sidebands.

RF550 contains high accuracy watt meter; calibrated in 400 and 4,000 watt scales; switch for forward or selected power; switch to select 5 antennas or dummy load. Order No. 805
Ham Net $75.00

RV550 is a solid state VFO. Function switch selects the remote unit to control Receive-Transceive-Transmit frequency independently. Order No. 804 Ham Net $95.00

SC550 Speaker Console with headphone jack. AC400 power supply will mount inside. Order No. 803 Ham Net $29.95

AC400 Power Supply is heavy duty solid state to operate GT-550A at full power, on SSB or CW, and with switch selection of 115/230 VAC, 50/60 Hz input voltages. Order No. 801 Ham Net $99.95.

Hy-Gain's *Super Thunderbird* TH6DXX

- "Hy-Q" Traps • Up to 9.5db forward gain • 25db front-to-back ratio • SWR less than 1.5:1 on all bands • Takes maximum legal power • 24-foot boom. Order No. 389
Ham Net $179.95

Hy-Gain's 18 AVT/WB

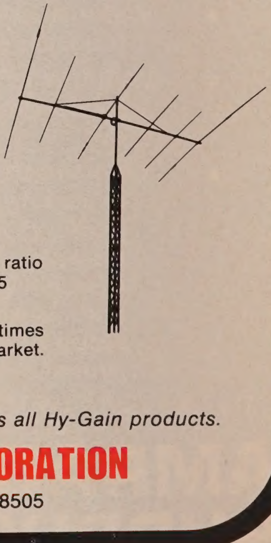
- Wide band performance, 80 through 10 meters • Three Hy-Q traps • Top loading coil • True 1/4 wave resonance on all bands • SWR of 2:1 or less at band edges. Order No. 386
Ham Net $59.95

Hy-Gain's Thunderbird TH3Mk3 (not shown)

- "Hy-Q" traps • Up to 8db forward gain • 25 front-to-back ratio
- Takes maximum legal power. Order No. 388 Ham Net $144.95

Hy-Gain's 400 Rotator/Indicator

- Handles large beams and stacked arrays with ease—up to 10 times the mechanical and braking capability of any rotator on the market.
Order No. 400 Ham Net $189.95



See the best dealer under the sun—the one who handles all Hy-Gain products.

HY-GAIN ELECTRONICS CORPORATION

P.O. Box 5407-FF, Lincoln, Nebraska 68505

A Universal Solid State Preselector/Converter for the SW Bands

BY JACK PEROLO,* PY2PE1C

Followers of Jack Perolo's articles will welcome this newest construction project: a solid-state converter and preselector which is universal in that it is easily adaptable for any i.f. range from 2-10 mc. Input, with the tuned circuits shown, is on any of seven of the shortwave BC bands in which the author specializes in monitoring as an "almost professional" s.w.l.

IN a previous article describing the GP-29[1] the pros and cons of multiple conversion receivers *vs.* single conversion ones were discussed in some detail. It was then (and still is) my definite opinion that for the home builder a high performance communications receiver could be more easily assembled if wired around a single conversion circuit; this opinion became even stronger after testing high frequency i.f. strips,[2] as the use of a McCoy filter allows a single conversion receiver within the usual SW band span, say up to 30 mc with excellent i.f. image attenuation and reasonable selectivity.

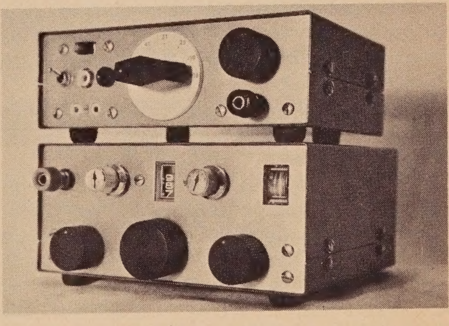
I must admit, however, that the average operator, be he an amateur, a SWBC listener, a utilities specialist or what have you, operates on more than one band; I could go one step further and estimate that most colleagues I'm in touch with do operate on at least three bands or thereabouts. It is also reasonable to assume that most operators aren't ready to stack on their operating desk seven different receivers as I presently do.

With these considerations in mind and aiming mostly at a set for field days, I went to work on a SW converter compatible with any GP receivers previously built.

Circuit Considerations

The qualification of "universal" to this converter stems from the fact that it was designed in such a way as to deliver its output in the 2-10 mc range without internal rewiring. This means that a receiver tuning anywhere between 2-10 mc will be compatible (frequency-wise) with this converter; chassis polarity is another matter and that needs to be studied individually for each case that may appear.

Since the crystal oscillator has capability to operate in the range 1-15 mc, the "universal-



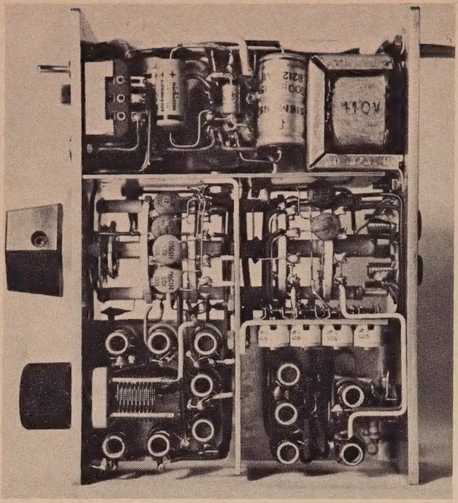
The converter is shown atop its companion receiver, the GP-32. Converter controls are (left to right): slide switch for calibrator above power on/off toggle switch, RCA jack for converter output, calibrator output jack, crystal socket (bottom left), bandswitch, antenna input (bottom right), antenna trimmer (top right). Bandswitch dial marking is in wavelength for shortwave BC bands.

---

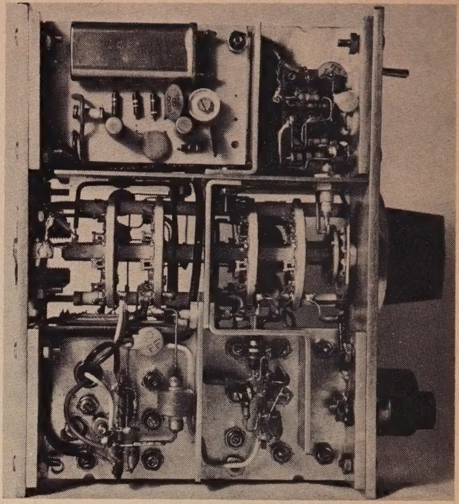
*P.O. Box 2390, Sao Paulo, Brazil.

[1] Perolo, J., "A Transistorized Communications Receiver with Digital Frequency Read-Out", *CQ*, July/August 1970, p. 14.

[2] Perolo, J., "A Solid State Permeability Tuned VFO with Digital Frequency Read-Out", *CQ*, October 1970, p. 18.



Top view. At bottom left is the r.f. compartment, just left of the mixer stage and associated trimmers. Bandswitch is at center with several fixed capacitors soldered to it which bring the coils into the desired range. At top left is the 100 kc calibrator switch. The regulated power supply is at the top. The power supply can also be used to run a companion receiver or other ancillary gear.



Bottom view showing the chassis built in two halves, fastened with 4-40 screws to the front and rear panels. The Petersen 100 kc crystal calibrator is at top left, with the local crystal oscillator at its right. The bandswitch is at the center while the r.f. stage is at the bottom. The mixer circuitry is at the left of the r.f. stage, at bottom. Notice shield locations and feedthrough capacitors.

ity" above is simply achieved by using different crystals, depending on the output frequency desired. To keep the converter compact, a bank of crystals is not installed and switched internally, but the crystal socket is located in an accessible spot on the front panel. Manual changing of crystals is therefore required when switching from one band to another, unless the unit is operated in the preselector mode.

A careful mixer spurious frequency analysis was not made at design time for the following reasons:

1. Such analysis is only true for the particular combination of frequencies used by the receiver following the converter. Since most prospective builders are likely to have available different receivers for this project, an individual analysis should be done for each particular case. A previous *CQ* article[3] might prove quite helpful on this matter.

2. Since in my case the converter was primarily designed as a stand-by unit (*Not* as main communication gear, as I have individual mono-band receivers for that purpose), the fact that a spurious might appear here or there was not overly critical.

3. Considering that the converter covers seven bands (*i.e.:* a variety of frequencies), I was bound to have some internal spurious anyhow, as I could not vary these two parameters on my receivers:

(a) Frequency coverage, as they are mono-band affairs

(b) Frequency reading, if I were to take full advantage of the digital read-out.[1,2] In other words, if the receiver covers, say, 4,600-5,200 kc and were to operate with the converter in the 25 m. band,[4] I did want to tune 11,700 kc exactly on the 4,700 kc dial reading, for a more comfortable operation.

4. Item 3(b) is, in fact, more limiting than it might appear at first sight, as out of *two* possible crystal oscillator combinations to receive the same frequency via the converter (*i.e.,* oscillator frequency *above* or *below* the received signal), I was forced to scrap one frequency before starting, because of the digital read-out feature of my receivers.

---

[3] Lee, J. G. "Mixer Spurious Frequency Analysis", *CQ*, September 1965.

[4] The 25 m. short-wave broadcast band covers 11,700-11,795 kc.

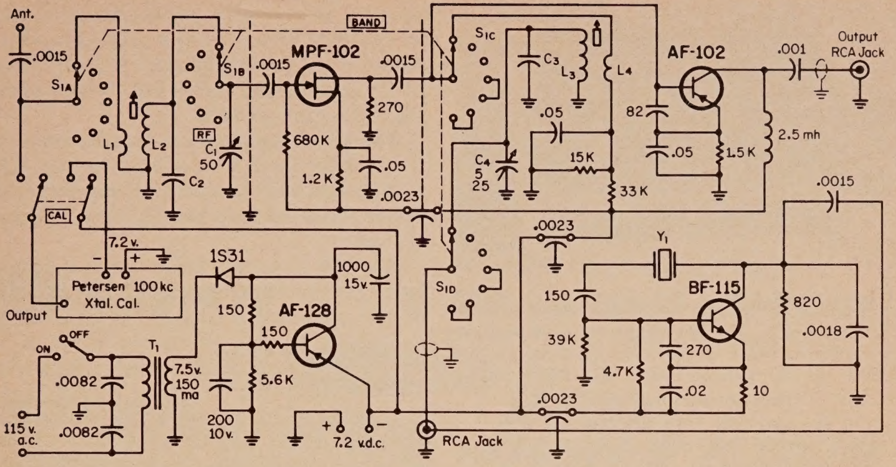

Ant.
.0015
S1A
L1
L2
C2
BAND
S1B
.0015
MPF-102
.0015
RF
C1
50
680K
1.2K
270
.05
.0023
S1C
C3
L3
L4
.05
C4
5
25
15K
33K
AF-102
82
.05
1.5K
.001
Output
RCA Jack
2.5 mh
.0015
CAL
7.2 v.
Petersen 100kc
Xtal. Cal.
Output
1S31
1000
15v.
150
AF-128
150
5.6K
200
10v.
7.2 v.d.c.
OFF
ON
T1
.0082
7.5v.
150
ma
115 v.
a.c.
.0082
S1D
RCA Jack
.0023
150
39K
.0023
Y1
BF-115
4.7K
270
.02
10
820
.0018

Fig. 1—Schematic of the universal solid state preselector/converter for the h.f. BC bands. Simple changes in the tuned circuits make the unit suitable for h.f. amateur band use. Table I details values for Y_1, L_1-L_4, and C_2-C_3 for each of seven h.f. BC bands. All resistors are 1/4 or 1/2 watt. Capacitors greater than one are in mmf unless otherwise specified; those less than one are in mf.

C_1—50 mmf miniature variable capacitor. Hammarlund MAPC-50B.
C_2, C_3—See Table I.
C_4—8-25 mmf ceramic trimmer. JFD Type P-25C.
S_1—Modified 6 pole 2-12 position miniature rotary switch. Centralab PA-2024.
T_1—7.5 v. 150 ma specially wound step-down transformer. Any transformer which will deliver 7.5 v.a.c. may be substituted.

Owners of receivers with doubly calibrated dials (*i.e.*, the dial has two logging scales, one going, say, higher in frequency when the dial is rotated clockwise and another still going higher in frequency when the dial is rotated counterclockwise) will not face this limitation.

A typical case is the 49 m. band.[5] I could have nicely stayed out of spurious if I were to oscillate at 11 mc (6 mc, converter input, *plus* 5 mc, receiver input[1]), but this would have used a backwards dial reading.

So the converter oscillator can only operate at 6 mc *minus* 5 mc = 1.0 mc and, sure enough a spurious appears within the band, exactly on 6.0 mc, being the 6th harmonic of the oscillator.

When the receiver and the converter tune the *same* band, the oscillator stays inactive (no crystal inserted) and the converter then operates as a preselector/booster. The gain is not as high as one could expect from a standard preselector, as the mixer stage is designed to operate with a medium to low gain and therefore does not behave as an outstanding r.f. stage in the preselector configuration. The "preselector" mode gain is about 10-12 db on most bands, though this figure varies depending on the characteristics of the receiver following it.

A strict tolerance of the crystal frequency is not really needed, as any deviation from nominal frequency can be easily corrected with the "Frequency" control of the receiver.

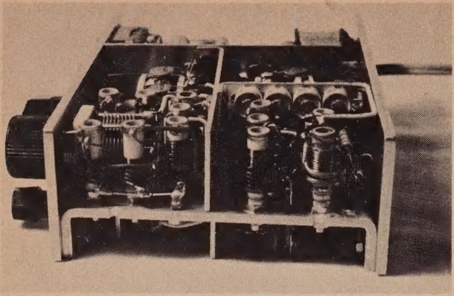
Looking at the photos, an option is left to the prospetive builder to either duplicate this unit as it is, with a built in power supply and a 100 kc crystal calibrator or to sacrifice both things in order to make room at the left side of the chassis for additional coils, for additional coverage. The bandswitch used (a Centralab PA-2024 unit) could permit up to 12 bands (7 were used).

The r.f. coils are designed to need some fixed parallel capacitance, so that the antenna trimmer is smooth to tune and does not require a mechanical vernier.

The mixer coils are broadband affairs as they are fixed tuned at the center frequency of each band.

---

[5] The 49 m. SWBC band covers 5,950-6,200 kc.



Right end view showing the r.f. coils and antenna trimmer at left, and the mixer compartment at right with its bank of trimmers installed on the central shield. Trimmers are JFD 3/8" round types for printed circuits.

As in all GP line, this converter was kept as small as possible, measuring 1.9" × 6" × 4.5" and weighing only 2 lbs.

Construction

Front and back panel (1.9" × 6", two needed) and the chassis (2" × 5.5", two units req.) are cut from 1/8" aluminum sheet. The two chassis are shaped to a U form, measuring 1/2" each side arm and 4.5" the central span, using a 16 ton press (nice, but not required!). Chassis and panels are fastened with 4-40 × 3/8" binder head nickel plated screws.

Internal shields are made of 1/16" aluminum sheet, their shape being visible in the photos. Notice that to save room the main shields are not fastened to either chassis, but are held in place by the bandswitch.

Table I

Band	Y_1 (kc)	L_1	L_2	C_2	L_3	C_3	L_4
60 m.	none	5.3	48	47	47	33	5
49 m.	1,000	3.6	32	47	32	33	3
41 m.	2,300	2.1	28	47	28	33	2
31 m.	4,700	2.0	16	100	–	–	–
25 m.	7,000	2.0	14	100	14	50	2
19 m.	10,300	1.7	10	47	–	–	–
16 m.	13,000	1.2	9	47	9	25	1.1

Figures for coils are numbers of turns. All coils wound on Miller 4500-0 $\frac{1}{4}$" dia. slug-tuned coil forms. Coils L_1 and L_4 are #22 plastic covered wire close wound on the cold end of L_2 and L_3, which are close wound of #26e.

Because of small clearances among components, several precautions should be taken at assembly time, as some parts can only be wired in a definite sequence. A careful study of the photos will surely help before getting started on this project.

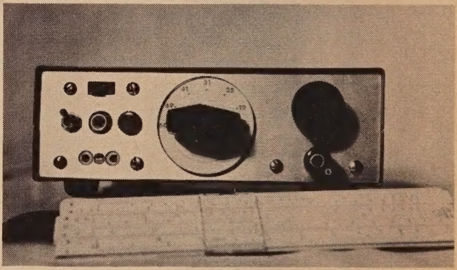
The power supply features a custom made transformer for 7.5 v., 150 ma output. After rectification and the electronic regulation and under a 100 ma load the d.c. output is about 7.2 v.d.c.

The 100 kc crystal calibrator is a Petersen unit, purchased complete for $12.95; the double pole switch cuts the antenna off the calibrator, besides energizing it. It is not recommended to operate this calibrator below 7.0 v.d.c. The calibrator output goes to the converter input, but a front panel jack permits feeding 100 kc harmonics to other gear.

The r.f. coils have no individual trimmers, to save space. A variable capacitor (MAPC type, Hammarlund) tunable from the front panel is used instead, with fixed capacitors of proper value soldered across each coil. One coil per band is used (See Table I), the values given being for SWBC bands: by proper interpolation and extrapolation it is possible to calculate the components value for ham band operation. The r.f. transistor is an FET, quite similar to that used in the GP-29 with good results. Notice that r.f. coils are shielded from the r.f. transistor, to assure no parasitics will develop.

The mixer stage has a small rack of 8-25 mmf trimmers installed on the partition shield with the bandswitch. Mixer output is fed to the front panel RCA jack via a coaxial

[*Continued on page 102*]



This front view of the converter next to a 5" slide rule helps illustrate the small size of the unit. The bandswitch dial is drafted oversize (about 2:1), photographed, and printed exact size, being held in place by a 3/32" thick plexiglass disc.

WHAT DO THESE COMPANIES ALL HAVE IN COMMON ?

SWAN
ELECTRONICS

GALAXY ELECTRONICS DIVISION
HY-GAIN ELECTRONICS CORPORATION
P.O. Box 5407-FC, Lincoln, Nebraska 68505

HEATHKIT
a Schlumberger company

Mosley Electronics Inc
4610 N. LINDBERGH BLVD., BRIDGETON MO. 63044

Henry Radio
11240 W. Olympic Blvd., Los Angeles, Calif. 90064

RCA
Rotators

ARROW ELECTRONICS, INC.
225 Rte 46 Totowa, N J
201 256 8555
Farmingdale, N Y
St. Norwalk, Conn
525 Jericho Tpke Mineola, N
516 Pioneer 2-2290

WORLD RADIO---
3415 West Broadway
Council Bluffs, Iowa 51501

NEW-TRONICS CORPORATION
15800 Commerce Park Drive
Brook Park, Ohio 44142

AMRAD SUPPLY
Oakland, California. 94607
415/451-7755

SINCE 1921
telrex
Communications and TV Antennas
LABORATORIES
Asbury Park, New Jersey 07712 201-775-7252

Just one thing. They all buy more pages of advertising in CQ than in any other ham magazine. In fact, more than half the companies listed above will buy more ad pages in CQ this year than in *all the other hams mags combined!*

These companies have found over the years that CQ is the best ad buy in the marketplace. And dozens of other companies are beginning to follow the leaders.

SO..

if you want to sell a product or service to your fellow hams, advertise where most of the pros advertise most consistently ––

CQ –– the best ad buy in any size budget.

The most powerful antennas under the sun!

STICK WITH HY-GAIN FOR TOP.....

In addition to offering top electrical performance, Hy-Gain antennas for mobile rigs offer extreme ease of mounting plus the same kind of rugged construction that goes into Hy-Gain professional and commercial mobiles. The line includes:

UNITY GAIN ¼ WAVE ANTENNAS

MODEL 787
Roof, Deck or Trunk Mounts
108-470 MHz

- Precision tunable to any frequency in the 108 to 470 MHz range, using cutting chart supplied with antenna.
- Power more than 100 watts.
- VSWR 1.5:1.
- Whip constructed of 17-7PH stainless steel for super strength.
- Low profile polypropylene base.
- Leakproof installation on roof or deck through any size hole ⅜″ to ¾″ with Hy-Gain's patented claw mount. May also be installed on trunk lip with Hy-Gain 555 adaptor.
- Complete with RG-58U coax and connector.

Order No. 787 Ham Net $6.70

MODEL 786—Same as Model 787 except does not include coax and connector.

Order No. 786 Ham Net $4.00

MODEL 759—Same as Model 787 except Alnico magnet base that permits instant installation and holds the antenna securely to any metal surface at speeds in excess of 90 MPH. Aluminum flange on base is capacitively grounded so there's no need to remove paint.

Order No. 759 Ham Net $16.00

787

See the best dealer under the sun—the one who handles all Hy-Gain products

HY-GAIN ELECTRONICS CORPORATION

P.O. Box 5407-FF, Lincoln, Nebraska 68505

. . .PERFORMANCE MOBILE ANTENNAS, TOO

GAIN ANTENNAS

MODEL 764
Roof or Deck Mount
Delivers 3db Gain on 2 Meters

- Photographically etched copper loading coil electrically extends antenna to ⅝ wave.
- Power rating 100 watts.
- VSWR 1.5:1.
- Whip constructed of 17-7PH stainless steel. Stainless steel spring. Base of high impact polypropylene.
- Hy-Gain patented claw mount through any size hole ⅜″ to ¾″.

Order No. 764 Ham Net $29.50

MODEL 707—Same as Model 764 except equipped with adaptor for easy no-hole, trunk lip mounting. (No Spring)

Order No. 707 Ham Net $18.00

MODEL 710—Same as Model 764 except equipped with Alnico magnetic mount. (No Spring)

Order No. 710 Ham Net $26.00

MODEL 712 DISGUISE ANTENNA
Cowl Mount
Delivers 3db Gain on 2 METERS

- Permits operation of both the AM car radio and FM transceiver with the same antenna.
- FM transceiver electrical characteristics basically same as Model 764.
- Made of automotive AM antenna standard chrome plate.
- Fits any standard AM hole.
- Comes complete, ready to install.

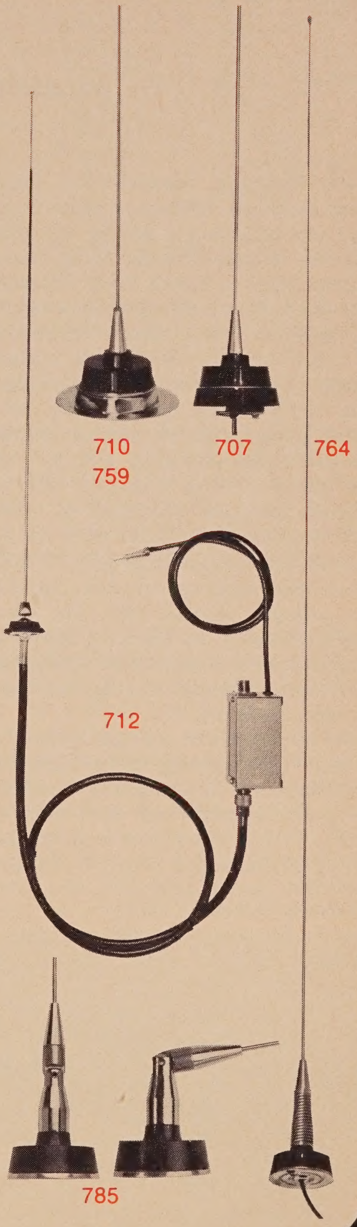
Order No. 712 Ham Net $22.50

ACCESSORY

MODEL 785
FOLD-OVER ADAPTOR

May be used with Models 787, 786 and 764 for low-obstacle, car-park or garage clearance.

Order No. 785 Ham Net $6.67



CQ Reviews:
The Pickering Model KB-1 Electronic Keyer

BY WILFRED M. SCHERER,* W2AEF

THE Pickering Model KB-1 Electronic Keyer is an all solid-state affair which, instead of employing a paddle by which the operator himself forms code characters, automatically produces code characters in response to pressing buttons on a typewriter-like keyboard. 47 different characters can be formed thereby. Besides the alphabetical letters and numerals, the following other code symbols and groups may be transmitted: period, comma, question mark, fraction bar, quotation marks, KN, BT, AS, AR, AA, SK or a string of dots (a 48th button).

Characters are produced at speeds of 12-72 w.p.m. (for which there is a speed control) and automatically provide the standard 3-baud spacing between characters (1 baud=length of one dot). The user thus simply operates the keyer in somewhat the same fashion as a typewriter is handled (with some minor differences in rhythm and touch as explained later).

Other features of the KB-1 are a control to vary the weighting (dot-to-dash ratio), a switch position for transmitter tuneup, built-in sidetone monitor with level control, separate jacks for headphone and speaker use, facility for keying a negative blocking bias to ground or a positive low-voltage cathode to ground.

The Pickering Model KB-1 Electronic Keyer.

Hand keying or that by a conventional hand-operated electronic keyer may be had through the unit without alterations of connections to the associated transmitter. There also is a jack through which the logic output of the KB-1 may be used for external gear that requires such a keying signal. The unit is powered from a 120 v.a.c. source using a self-contained power supply.

Besides providing convenient formation of perfect characters for keying a transmitter, the KB-1 is an excellent device for use in learning the code and for such practice. By depressing the button for any particular character, the keyer will automatically produce that character, enabling the newcomer to hear how it is formed and how it actually sounds. Once the learner has mastered this angle, anyone else not even knowing the code, can transmit code practice at slow speeds to the listener simply by depressing the required buttons in proper sequence. In addition, many pairs of headphones may be connected to the keyer for group practice. It also can be used to key an external a.f. oscillator, such as where the oscillator is already wired for group instruction.

Lineup

A functional block diagram for the KB-1 is shown at fig. 1. The keyer employs a fully-clocked digital system whereby each change of its state occurs within a time determined by the clock pulses. It thus controls the sending speed. A uni-junction transistor is used for the clock oscillator along with a constant-current source that ensures a linear speed-control characteristic.

The keyboard consists of 48 s.p.s.t. switches wired as a 48 position selector switch. Activating a keyboard switch energizes one of 48 corresponding output circuits

---

*Technical Director, *CQ*.

to a diode matrix (Translator) which generates a unique 7-bit digital "word" for each keyboard button. The "word" is then fed simultaneously (in parallel) into a shift register (Character Register) which reads one "bit" of the word at a time, and depending upon whether that bit is a binary "0" or "1", directs the element generator to produce a dot or a dash, each followed by a dot-length space. Upon completion of each such element, the Control Block permits the shift to proceed to read the next bit. After all necessary elements for a character have been generated, a final bit in the "word" signals the Control Block of the end of the character.

The control section also is arranged to cause the proper spacing to be set up at the end of each character. In the event that the button for the following character is depressed before the 3-baud spacing occurs, the generation of that character is held up until the end of the proper spacing time.

The element generator operates the positive- and negative-keying circuits, each one of which employs a switching transistor and using a steering diode for protection against accidental reverse polarity at the key terminals. The sidetone monitor also is keyed and is provided with headphone and speaker outputs there is no self-contained speaker in the unit.

Construction

The KB-1 is built on a glass-epoxy circuit board and employs 12 IC packages for the flip flops, NOR gates and an expandable line driver, plus 6 diodes and 12 transistors. The unit is contained in a 3⅞" × 10⅛" dull-black metal case 2½" high. Long tapered rubber feet on the bottom of each end of the case are placed so that the unit tilts slightly upward.

Volume, speed and weight controls are on the front of the unit along with a 3-position toggle switch that turns the power on and off with the 3rd position used for activating the transmitter during tuneup. There are no calibrations for the speed and weight controls; but in the case of the latter, the center position is specified as providing a 50-percent dot duty cycle. The extremes provide an approximate 40- and 60-percent duty cycle.

The pushbuttons with the symbols are at the top side of the case and are arranged according to the standard typewriter keyboard with the special groupings located at the ends.

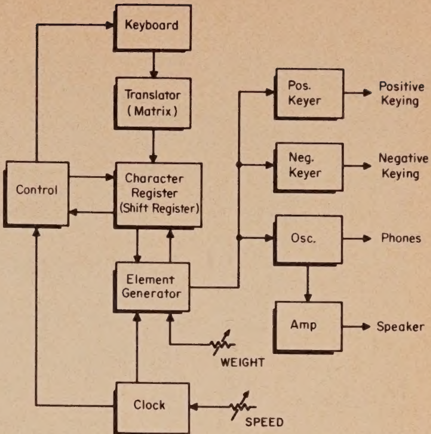


Fig. 1—Block diagram for the KB-1 keyer. A condensed description is given in the text.

The rear of the unit has a fuse holder, a receptacle for a detachable 3-wire a.c. power cord, a standard jack for headphones and phono jacks for a loudspeaker, positive-keying and negative-keying output circuits, hand keying and utility (logic output).

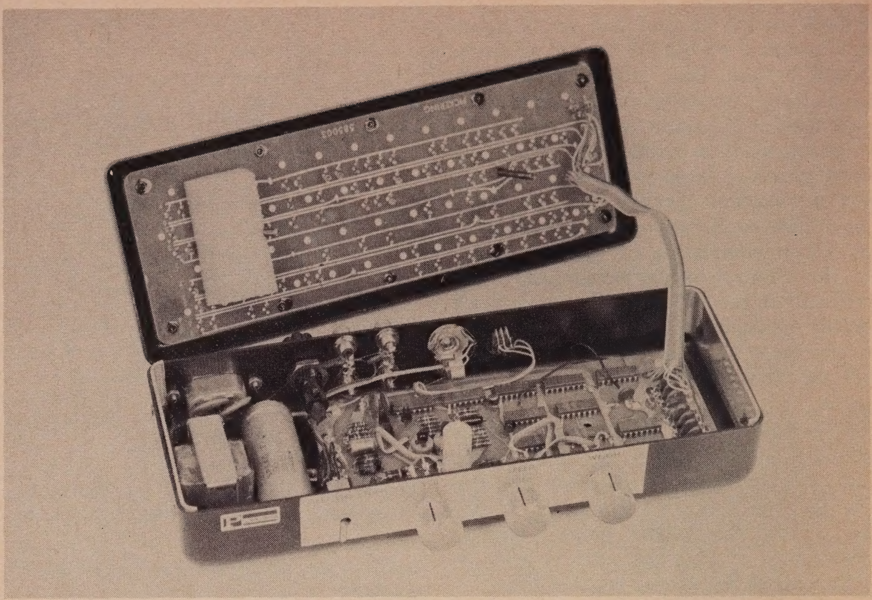
Operation

The button movement is approximately .020" and requires a force of about 4 ounces. There is hardly any feeling to the movement, except for a slight "rubbery" action. The touch is similar to that required for an electric typewriter; however, one of the major differences (over a mechanical typewriter as well) in operating the KB-1 is in the timing or the rhythm. There is no memory, except that needed to form each individual character and the following space, making it necessary to properly time the depressing of the different buttons which will vary according to the length of the preceding character.

The buttons are not to be "tapped" as with an electronic typewriter, but rather must be held down until generation of the related character commences,[1] at which time the button for the next character may be held down until generation of its character starts. Since the character generation with each button includes the following

---

[1] The button for the initial desired character must be released before the next character starts.



Interior view of the KB-1. There are two boards interconnected with a 9-wire cable.

space, the succeeding character cannot "jump the gun" and appear before the proper spacing. If erratic spacing is to be avoiding and perfect spacing is to be had between characters (that is, spacing no greater than the normal 3-baud length), the user must time his finger movements according to the length of each character. For the short ones (such as e, i, t) the related button thus must be released sooner than for the longer characters, with movement to the next needed button also made in shorter time. The required rhythm of finger movement thus varies from character to character and is one to which one must accustom himself. This is not hard to come by, at least it was not so from the experience of this writer who is accustomed to typing at a pretty good clip using the "two-finger hunt system" with either a mechanical or electric machine.

In the case of code learning, the spacing is not necessarily as important, until the student recognizes the formation of each character. Exact timing between characters then is not mandatory, therefore enabling one not familiar with code to operate the keyer for the learner.

The negative-keying circuit is used for blocked-grid keying or other methods requiring a negative potential at the key. This circuit is rated for use with potentials of up to 150 v.d.c. and for currents up to 15 ma. Values in excess of either of these restrictions require employment of an external relay operated by the positive-keying circuit.

The positive-keying setup is designed for operation with low-level cathode circuits where the peak current is under 100 ma and the peak potential is within 60 v.d.c. These ratings include transients. Where both values are apt to be exceeded, an external relay must be keyed by this circuit with the proviso that inductive spikes from the relay coil are supressed to maintain the peak potential within the 60-volt limitation. A simple suppression circuit, using a resistor and a diode, is described in the manual which also includes explicit operating, installation, technical and maintenance details.

The keyer may be nicely handled while placed on a table top or in one's lap; however, with the latter, care must be taken to see that bunched-up clothing does not accidentally knock the speed control off its desired setting. If you'd like to sit back and take it easy "typing" out perfect code transmissions or assist others in learning code, the Pickering Model KB-1 Electronic Keyer is an ideal device for accomplishing these ends. It is priced at $265 and is a product of Pickering Radio Company, Post Office Box 29, Portsmouth, R.I. 02871. *—W2AEF*

CQ to announce major subscription price increase

$$$ave $$$AVE $$$ave $$$ave

The newly announced postal rate increases, coupled with rising costs for printing and labor, will force us to announce a major subscription price increase in the very near future.

In order to protect our regular subscribers, we're making this information known in advance to allow you to order long-term subscriptions and save $$$$. Newsstand prices are already up to $1.00 per month or $12.00 per year. The savings on these long-term subs will be substantial. And when we say long-term, we really mean it. These rates are offered for a limited time only and may be withdrawn at any time.

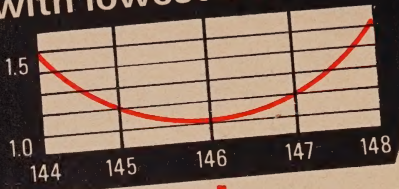
1 year	$6.00
2 years	$11.00
3 years	$15.00
5 years	$23.00
10 years	$40.00
15 years	$55.00
Life Subscription	$75.00

As you can see, we've offered a variety of choices that enable every reader, regardless of age, to select the best choice for his own needs. And believe us when we say that the savings will be substantial over future rates. **So don't delay. This offer may be withdrawn very soon.**

with HUSTLER® VHF mobiles

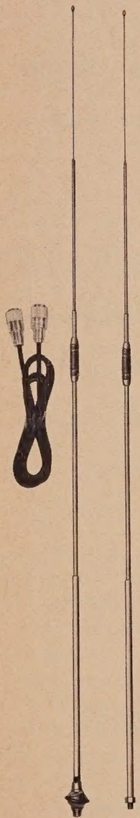
you can be sure of OPTIMUM GAIN with lowest SWR . . .

Typical SWR—BBL Models



to push your signal MILES more...

6 & 2 METER MOBILE


HF-62 HF-2

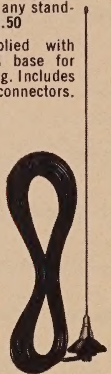
Heavy duty, precision fit, four section telescopic antenna tunable separately for combined six and two meter operation. Extends to 44″. Collapses to 22″.

Model HF-2: Antenna supplied with ⅜″-24 base to fit any standard antenna mount. **$9.50**

Model HF-62: Supplied with automotive eight ball base for fender or cowl mounting. Includes 60″ RG-58-U and connectors. **$11.95**

Tops in Rooftops

140-500 MHz—UHF/VHF Antenna

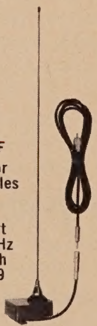


Low profile, roof top with factory attached cable—installs from outside without disturbing car header. 17-7 PH stainless radiating element—field trimmed for frequencies between 140 and 500 MHz. Complete with 15′ RG-58-U coaxial cable.

Model UHT-1
$7.75

Trunk Lip Mount

140-500 MHz UHF/VHF



Easy to install on side or rear of trunk lip. No holes to drill or coax to trim. 17-7 PH stainless steel radiating element. Chart included for 140-500 MHz coverage. Complete with 17′ RG-58-U and PL-259

Model THF
$12.95

NEW!

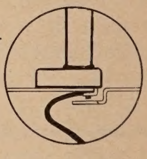
2 METER POWER GAIN

143-149 MHz
3.4 db gain—⅝ wavelength
Power rating: 200 watts FM

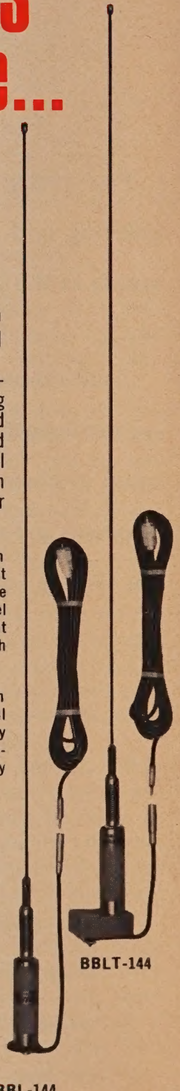
Get the experience of solid communications, extended range and full quieting with the Hustler BBL models. Optimized gain performance with lowest SWR and the superior mechanical construction will give you the extra advantage. Both models supplied operational, ready for easy installation.

Model BBL-144: Mounts on any flat surface in ¾″ hole—easy installation on roof, (without pulling cars' header), deck or fender—complete with adjustable, taper ground stainless steel radiator, stainless steel spring. Overall height approximately 47″, 17′ RG-58-U coax with PL-259 connector. **$27.70**

Model BBLT-144: Same as BBL-144 with Hustler trunk lip mount for no holes to drill installation on side or rear of trunk lip. Heavy duty mount assures "stay-put" operation, positive RF ground for lowest SWR and completely hidden cable. **$34.70**



Exclusive Hustler "break cable" assembly for simplest installation of all!


BBLT-144
BBL-144

World leader in Antenna Mounts—send for Catalog today!

NEW-TRONICS CORP.

15800 COMMERCE PARK DRIVE
BROOK PARK, OHIO 44142

Available From All Distributors who Recognize the BEST!

World Wide Export, Roburn Agencies, Inc., 349 W. 14th St., New York, N.Y. 10014, Cable Address: Roburnage - New York

FM: How To Speak It

BY GLEN E. ZOOK,* K9STH/5

MANY amateurs have probably noticed that *CQ* is now giving much more emphasis to f.m. activities than in the past. It is hoped that this emphasis will serve two purposes: The first is to attract more active amateur f.m. operators to become subscribers; the second purpose is to convert amateurs now operating with other modes to the f.m. fold.

F.m. serves a distinct need within the ranks of the amateur radio operator. It provides a simple method of mobile operation, provides for a network for emergency operation, and provides a fixed frequency intercom channel. Many DX operators use f.m. to inform each other of a rare station or prefex (after working him, of course). Fixed frequency operation allows a mobile operator freedom from constant retuning of equipment and from missing a call because he is a few kc off frequency. The widespread use of repeaters with input and output frequencies coordinated allows the travelling amateur communication with local stations in virtually every city in the United States and Canada.

These are only a few of the many reasons for the rapid growth of amateur f.m. activity. No matter what the reason for going on v.h.f. f.m., the newcomer must learn a new language. Remember back to your Novice days, or even back to s.w.l.'ing. You had to learn a new language, the language of amateur radio. The same is true for amateur f.m. operation. Of course many phrases and slang terms have the same meaning, but there are many phrases and terms which appear in no other form of amateur operation. As an aid to the newcomer, a Glossary of sixty-three commonly used terms and phrases is provided here. The definitions given here are virtually universal. However, certain localities may have local terms and phrases for the same thing or for other items. These terms will be picked up as you go along. The definitions in the Glossary should serve to start the new f.m. operator off on the right foot.

Glossary of FM Terms

Accent: The Accent line of equipment was produced by General Electric for the 450 to 470 mc commercial band. The unit is tube-type with a transistorized power supply. Construction is primarily on a single printed circuit board.

"BD": The "BD" or Business Dispatcher is a line of equipment manufactured by Motorola. The receiver is solid atate and the transmitter is tube-type with solid-state audio preamplifier. Most versions are dash-mount with a power output of 15 watts. The newer units are called Mocom 30 and may be truck mount. The Mocom 30 units may be rated at 25 watts output, depending on model type.

Belly Band: The term "Belly Band" is sometimes applied to the use of 7.5 kc deviation, rather than the usual 15 kc or 5 kc deviation. This 7.5 kc deviation is usually compatible with both wide-band and narrow-band equipment.

Black Oven: These crystal ovens, often used in older types of Motorola equipment, have a temperature rating of 60 C. The stability meets the 0.002% now allowed for low-band commercial standards. However, they will not meet the .0005% for high band or 450 operation by commercial stations. These ovens are normally satisfactory for amateur f.m. on all types of equipment which will accommodate them.

Brick: A brick is one of several types of newer design portable equipment, including the following: Motorola HT-200 (H23DCN, etc.), General Electric MASTR Personal series, and the Varitronics-Inoue HT-2. This type of equipment may be handled with only one hand and is normally less than two pounds in weight.

Channel Element: A channel element is an assembly used in place of the single crystal in controlling either the transmitter or receiver in newer types of f.m. equipment. The channel element contains a transistorized oscillator, buffer, and frequency compensating networks. The channel element is unheated, thus requiring much less current from the source. Stability of these channel elements may exceed 0.0002% depending on design.

Coffin Sets: This is a term often applied to the old types of f.m. equipment using a separate transmitter and receiver. This type of equipment was housed in cabinets with rounded tops resembling small coffins. In some areas this type of equipment is referred to as "dog house."

Continuous Tone Squelch: CTS is a method of tone control of the f.m. equipment wherein a virtually subaudible tone (70 to 200 c.p.s.) is transmitted along with the desired voice audio. This tone activates a reed or other frequency sensitive circuit in the receiver allowing reception of the voice audio. Signals without the proper tone or with no tone at all are not heard.

---

*818 Brentwood Lane, Richardson, Texas 75080.

Control Head: The control head is that portion of the f.m. unit containing the off-on switch, volume control, squelch control, and microphone connections. When used with a trunk mount unit the control head is normally mounted under the dash of the automobile and connected to the unit via a multiconductor cable.

"COR": A COR or Carrier Operated Relay is a circuit which is activated by the reception of a signal by an associated receiver. Normally the COR operates from the squelch circuit of the receiver, activating when the squelch circuit opens the blocking voltage on the audio circuitry of the receiver.

Croppie Pole: This is a type of high-band antenna consisting of a helical winding encased in fiberglass. The normal gain of this type of base station antenna is from 6 db to 9 db. The antenna is very long and resembles a large fishing pole.

Dash Mount: A dash mount f.m. unit is of the type wherein the entire unit mounts under the dash of an automobile. The speaker, microphone, and all controls are usually mounted on the front of the unit for easy access.

Desk Set: A desk set is a telephone-resembling unit which is connected to the base station via a multiconductor cable. Provision for push-to-talk operation and reception is normally provided. Some models also provide for switching of frequencies.

Deviation: The deviation of an f.m. transmitter is the amount the modulated signal carrier varies from the center frequency. During one half of the modulating cycle the deviation is positive and during the other half cycle the deviation is negative. See also narrowband and wideband definitions.

Diplexer: A diplexer is a device which allows simultaneous (duplex) transmission and reception from a single antenna. Diplexers range from simple cavity arrangements (where frequency separation is great) to complex hybrid-ring units for close separation. Some people refer to a diplexer as a "duplexer," however, the correct term is "diplexer."

Discriminator: The discriminator is the detector in the f.m. receiver. It first converts the f.m. signal to a.m. and then demodulates the a.m. signal, thus producing the desired voice audio signal. It is analogous to the product detector in s.s.b. receivers and diode detector in a.m. receivers.

"DTO": The DTO is a type of f.m. unit manufactured by General Electric for MTS (see definition) service. The receiver has no squelch circuit (one may be added, however). The unit normally has provision for five channel operation, making it a very desirable unit for amateur f.m.

able unit for amateur f.m.

Duplex: Duplex operation is that operation wherein simultaneous reception and transmission takes place. This occurs in amateur repeaters. A signal is transmitted from one transmitter, received by the repeater receiver and retransmitted on another frequency by the repeater transmitter. This type of operation also is used in mobile telephone service. However, when used as telephone the operator can receive and transmit at the same time.

Four Fifty: In reality the term applied to the u.h.f. commercial radio frequency band from 450 mc to 470 mc. Amateur f.m.'ers use the term for the amateur band from 420 mc to 450 mc.

Gold Oven: The gold colored crystal ovens which maintain a tolerance of better than 0.0005%. These ovens meet present commercial standards. The operating temperature is 85 degrees C. These ovens replace the black ovens when converting to commercial narrowband standards.

Handie-Talkie: This term is a registered trademark of Motorola and applied to the Motorola line of hand carried portable equipment. In general, amateur terminology the term and its abbreviation (HT) is applied to all units which can be easily hand carried.

High-band: This is the commercial radio band from 152 mc to 172 mc. Amateur usage often includes the two meter amateur band.

Ice Box: This term is sometimes applied to the line of amateur f.m. equipment manufactured by International Communications & Electronics (ICE) of San Antonio, Texas. These were among the early entries in the solid-state equipment built exclusively for amateur f.m. operation.

"IDC": IDC for Instantaneous Deviation Control is a Motorola trademark for the circuitry which controls and adjusts the deviation of the f.m. transmitter. The term is sometimes applied to the potentiometer which is adjusted to set the level of maximum deviation.

IMTS: IMTS is the abbreviation for Improved Mobile Telephone System which is now being implemented in many areas. This system allows direct dialing from the mobile telephone, both for incoming and out-going calls. IMTS replaces the old MTS (see definition).

Intermod: This is a contraction of the word intermodulation. Intermod is caused by the mixing of two or more signals in a non-linear device (rusty pipe joints, for example) with a resultant signal on a third or more frequencies. In areas where many signals are present, intermod may be present on all available channels. Intermod, unfortunately, is a fact of life and is very difficult to eliminate. Sometimes a crystal filter or other similar narrowband device may be used in the antenna lead to the receiver to eliminate intermod. However, this will not work if the offending signal is on the desired frequency.

Limiter: The limiter circuit in an f.m. receiver is an i.f. circuit which saturates at a relatively low signal strength, thus keeping the audio output from the discriminator at a constant output. The audio output from a discriminator is directly proportional to the signal output, thus requiring a constant signal level for a constant audio level. It is analogous to a.v.c. in the conventional a.m. receiver.

Low-band: This is the commercial band stretching from 25 to 28 mc and from 30 to 50 mc. The term is often applied in amateur circles to include the f.m. operation in the 10 meter and 6 meter amateur bands.

Machine: A machine is a complete repeater system.

MASTR: MASTR is the registered trademark of General Electric for its newer type of Progress Line equipment. MASTR equipment include base stations, mobile stations, and portable and paging units.

MICOR: MICOR is a registered trademark for Motorola's present "top-of-the-line" f.m. communications equipment. The equipment is fully solid-state in various frequency and power combinations.

Model 80: A Model 80 is not a piece of RTTY equipment. It is a signal generator manufactured by Measurements Corp. which was the mainstay of the commercial f.m. service business for many years. The basic generator covers from 2 to 400 mc, and the Model 80R covers 5 to 475 mc. This generator and its military equivilents (e.g. TS-497B) are used by many amateur f.m.'ers.

Motrac: This is a Motorola trademark for its line of mobile communications units using solid-state receivers and hybrid transmitters.

Motran: This is a Motorola trademark for its early line of completely solid-state communications equipment. The Motran has been replaced by the Micor line.

"MRT": The various MRT pieces of equipment were manufactured by Bendix. Many amateurs are now using MRT equipment on both six and two meter f.m.

"MTS": MTS or Mobile Telephone System is the older type of car telephone system wherein all calls were placed through an operator. Operation was duplex. MTS is now being replaced by the newer IMTS.

Narrowband: Narrowband is the designation for commercial operation using 0.002% tolerance on lowband and 0.0005% tolerance on high band and 450 with a deviation of 5 kc. Amateur operation is now gradually switching over to narrowband standards because of the availability of equipment designed for this type of operation. The term "Split-Channel" is sometimes used for narrowband operation.

Overlap: Overlap designates a simultaneous coverage of two or more repeaters using the same input and output frequencies. This problem often occurs in large metropolitan areas with more than one repeater in operation.

Pacer: The Pacer was a dash-mount f.m. unit manufactured by General Electric. The unit was hybrid in design and constructed primarily on circuit boards.

Permakay: The Permakay is a Motorola trademark for its line of selective i.f. filters (usually 455 kc). The filters are usually of two types, that with a bandwidth of approximately 30 kc for wideband operation and 10 kc for narrowband operation. The newer types may be identified by the letter suffix of "S" for narrowband and "W" for wideband.

Porta-Mobile: This is a General Electric trademark for a number of pieces of equipment which can be installed in an automobile and then easily removed for portable operation.

Progress Line: A General Electric trademark for its line of pre-transistor equipment. Later models used a transistorized power supply. These units may be equipped for operation for up to 4 channel operation.

Private Line: Motorola's trademark for its version of continuous tone squelch.

Quiet Channel: RCA's trademark for its version of continuous tone squelch.

Reed: Any of a number of frequency sensitive encased circuits which are used in selective tone signaling or for CTS operation. A reed may be either for encoding (transmitting) or decoding (receiving).

Remote: A remote is a unit which can be used to control a remotely located base station via either a continuous two wire or four wire line. Switching is accomplished by a d.c. voltage of a given polarity. Audio, both transmitted and received, is also carried along the same wires. This technique is often used to place the base station at a very high point (such as a building roof or TV transmitting tower) several miles from the dispatch point. Newer types of remotes use audio tones for switching eliminating the need for a continuous pair of telephone wires.

Repeater: A repeater is any of a number of radio devices which receive a signal and retransmit it on a second frequency at the same time.

Secode: Secode is a manufacturer located in Dallas, Texas, who manufactures several types of control heads for RCC, IMTS, and MTS operation. The term Secode is sometimes applied in amateur f.m. circles to describe any of these control heads.

Simplex: The operation on a single frequency. Both transmission and reception takes place on this frequency. Operation on the 160 through 10 meter amateur bands is normally simplex. In this case the transmitter is turned off during the reception period. This is in contrast to duplex operation during which the receiver and transmitter can be operated simultaneously.

Single-tone: The use of an audio tone of short duration to activate a receiver for control purposes. Such a tone may be sent at either the beginning of a series of transmission or at the beginning of each transmission. It differs from CTS in that the tone is of short duration. A single tone system may be used either to select a given repeater receiver or to prevent unauthorized use of a repeater.

Strapping: Strapping is the term applied in many of the newer types of equipment manufactured for amateur f.m. operation. Therein, two or more switch positions may be jumpered to allow the use of a single crystal with several other crystals for various frequency combinations.

Test Set: This is a piece of test equipment designed for use with equipment manufactured by a given company. It normally contains metering and other facilities for checking and aligning the equipment. Both Motorola and General Electric manufacture test sets for their equipment.

Time Out: A time out timer is often used on a repeater to prevent the tying up of the frequency in case of either a continuous carrier on the input frequency or by malfunction in the repeater. The normal time span is from 1½ to 3 minutes. A time out timer also discourages long-winded transmissions, thus allowing other stations to break-in, if desired. The timer resets when the signal on the input frequency stops.

Tone-Burst: A tone burst system is a type of single tone operation. The tone is sent for a short period of time at the beginning of a contact. This allows the repeater receiver to operate. After a period of time with no transmissions, the receiver automatically resets, thus requiring another tone burst to allow the receiver to operate. Until the receiver resets, it will receive any transmission on the proper frequency.

TPL: TPL or Transistorized Progress Line is the General Electric trademark for its line of mobile f.m. units using transistorized receivers and tube-type transmitters. In the case of trunk mount units the majority of the receiver circuitry is located in the control head.

T-Power: Originally, "T-Power" was a Motorola trademark for its line of tube-type equipment us-

[*continued on page 99*]

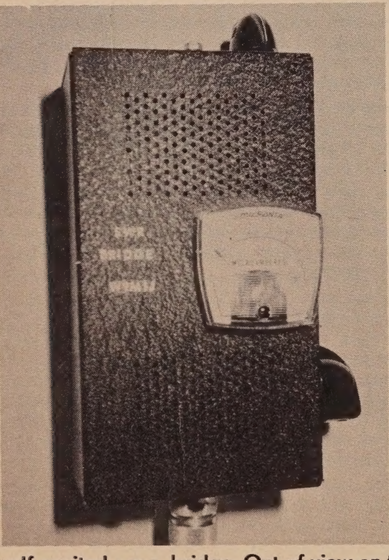
An S.W.R. Bridge With A Built-In 80 Through 10 Meter Signal Source

BY TIMOTHY P. HULICK, LT. USN,* W9MIJ/4

ONE of the questions frequently asked on the Advanced and Extra class exams is, "Where should s.w.r. measurements be made on a resonant antenna—at the antenna or at the transmitter end of the transmission line?" The answer to this question is, of course, at the antenna. The transmission line, if of appreciable length, will tend to flatten out the bandwidth of the antenna system (antenna plus transmission line) and must not enter into the tuning of the antenna if the antenna is to be truly resonant by itself. I am sure that most hams have found this to be rather difficult to do in most cases. In addition, it usually involves at least two people—one at the transmitter adjusting the frequency and the r.f. level to the bridge at the antenna end of the line and the other person up on the tower tuning the antenna. And how many times have you lost your sense of humor fumbling around with connectors that don't mate to the s.w.r. bridge while standing on the tower shouting down to the shack to change the r.f. level because you and/or your bridge are going up in smoke? I for one have been down this street many times too often and have decided to transform antenna tuning into not so an harassing procedure.

The device described in this article is an s.w.r. bridge with its own built-in signal sources for each band 80 through 10 meters. The oscillators are crystal controlled at the desired antenna tune-up frequencies and supply adequate power to fully deflect the meter on the bridge section. It provides for tuning the antenna at the antenna even before the transmission line is routed up the tower. There is no danger of burning out the bridge or burning up yourself with excessive r.f. from the transmitter because the oscillators are capable of only a few milliwatts.

Although the device is designed for 80 through 10 meter operation, 160-meter capability can be obtained by duplicating the 80 or 40 meter oscillator and using a 160 meter crystal. 6-meter capability is achieved by duplicating one of the overtone oscillator circuits and using an appropriate overtone crystal and r.f. transformer. Obviously, the circuit board would have to be modified from that which is described below.



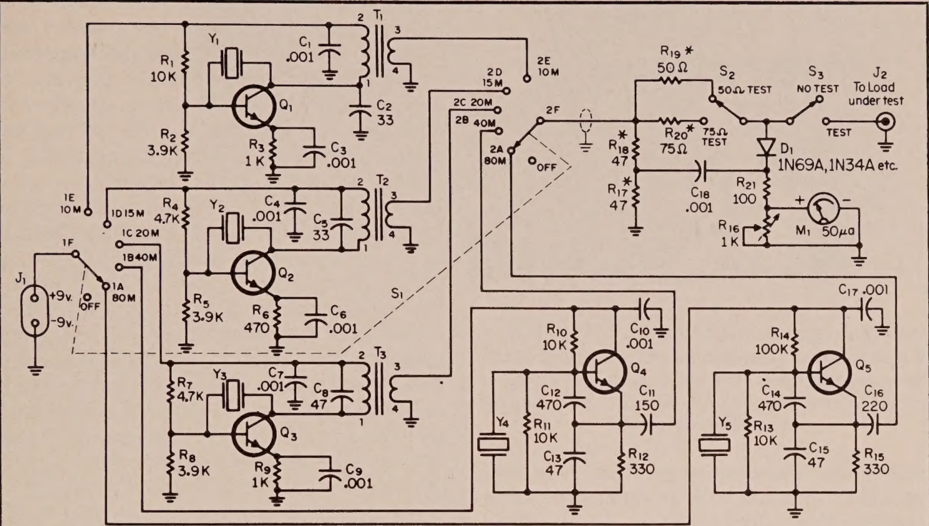
The self-excited s.w.r. bridge. Out of view on the bottom is S_2 which selects either 50 or 75 ohm impedance operation. At the right is the meter calibration control R_{16} while the band switch S_1 and Test-No-Test slide switch S_3 are at the top.

Circuit Description

The complete circuit of the self-exciting s.w.r. bridge is shown in fig. 1. It was decided to use separate complete oscillators for each band in order to alleviate the horrendous switching problem that would be necessary if one transistor were expected to do the job of five. In order to select the desired oscillator to supply the bridge section with r.f. and hence the antenna, the present configuration only requires that the supply voltage and the oscillator outputs be switched. Current drain on the 9 volt battery is about 12 ma maximum at any one time.

---

*3549 Clubhouse Road, Virginia Beach, Virginia



R1 10K
R2 3.9K
Y1
C1 .001
2 T1 3
4
1
C2 33
Q1
R3 1K
C3 .001
2D 15M
2E 10M
2C 20M
2B 40M
2A 80M
OFF
2F
1E 10M
1D 15M
1C 20M
1B 40M
1A 80M
1F
J1
+9v.
-9v.
OFF
R4 4.7K
Y2
C4 .001
C5 33
2 T2 3
4
1
Q2
R5 3.9K
R6 470
C6 .001
S1
R7 4.7K
Y3
C7 .001
C8 47
2 T3 3
4
1
Q3
R8 3.9K
R9 1K
C9 .001
R19* 50Ω
S2 50Ω TEST
S3 NO TEST
J2 To Load under test
TEST
R18* 47
R17* 47
R20* 75Ω
75Ω TEST
C18 .001
D1 1N69A,1N34A etc.
R21 100
R16 1K
M1 50μa
R10 10K
C10 .001
Q4
C12 470
Y4
R11 10K
C13 47
C11 150
R12 330
C17 .001
R14 100K
Q5
C14 470
Y5
R13 10K
C15 47
C16 220
R15 330

Fig. 1—Schematic of the s.w.r. bridge with built-in 80 through 10 meter signal source. All resistors are 1/4 watt, 10% tolerance except those marked (*). Capacitors are disc-type. Values greater than one are in mmf; less than one in mf.

Q_1-Q_5—RCA 40245.
S_1—2 pole 6 position subminiature rotary switch. (Centerlab PA-2005).
S_2—S.p.d.t. slide switch.
S_3—S.p.s.t. slide switch.
T_1—Pri.: 11 t. #36 e. Sec.: 3 t. #36 e. on Indiana General CF-101 Q2 toroid.
T_2—Pri.: 16 t. #36 e. Sec.: 4 t. #36 e. Same core as T_1.
T_3—Pri.: 20 t. #36 e. Sec.: 5 t. #36 e. Same core as T_1.
Y_1, Y_2, Y_3—Overtone crystals for 10, 15 and 20 meter bands respectively. HC-6U holders.
Y_4, Y_5—40 and 80 meter crystals respectively in HC-6U holders.

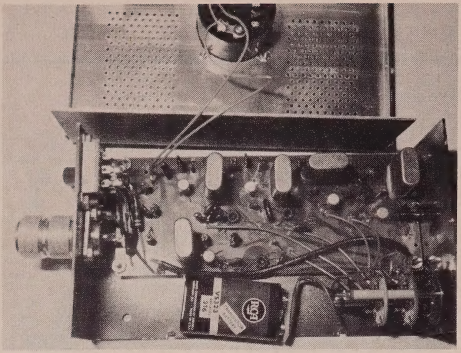
The oscillators for 10, 15, and 20 meters are overtone oscillators requiring overtone crystals and a resonant circuit somewhat below the crystal frequency. C_2 and the inductance between terminals 1 and 2 of T_1 should resonate at about 26 mc for the oscillator to operate in the 10 meter band. Correspondingly, T_2 and C_5 should resonate at about 19 mc, T_3 and C_8 should resonate at about 12 mc for oscillation in the 15 and 20 meter bands, respectively. Each crystal should be selected to be at that frequency near which the appropriate antenna is to be tuned. The 40 and 80 meter oscillators are not overtone oscillators and therefore require no resonant circuit.

The bridge section of the circuit is identical to the one described in any ARRL *Handbook* except that a slide switch S_2, is provided to change the impedance that the bridge is to balance against from 50 to 75 ohms and vice-versa.

The meter used in this bridge is any 50 microampere meter that is small enough to fit on the case of the instrument. A meter with a full scale deflection greater than this is inadequate because full scale deflection will not be realized which is necessary for proper operation and calibration as described in "Operation and Bridge Calibration," below. A 50 microampere meter is no more expensive than any other and is also available miniaturized.

The function of S_3 is to connect and disconnect the antenna from the bridge during bridge calibration. This switch solves the problem of physically removing the load by unfastening connectors which is most unhandy at an elevation of 70 feet. The function of S_3 is further described below.

R_{17} and R_{18} are each a 47 ohm resistor. This pair of resistors must be closely matched in value in order for the bridge to balance at the proper antenna load impedance. Ordin-



With the cover removed from the 6¼ × 3½ × 2 inch Minibox, the location of most components becomes apparent. The meter must be located so as not to interfere with internal circuitry when the cabinet is assembled.

arily, 5% tolerance is sufficient, but they should be checked with an ohmmeter nevertheless. Their absolute value is not critical, but they must be closely matched in relative value. R_{19} and R_{20} should also be 5% tolerance resistors. These resistors should be as closely matched to the antenna impedances as possible.

Construction

In conjunction with fig. 1 and its parts list, fig. 2 is meant to make the construction of this project as simple as putting any kit together. Figure 2A is an actual size drawing of the underside (foil side) of the printed circuit board and is intended to be used as a template for mapping out the circuit configuration. My favorite technique is to sketch the layout on paper as is done for the builder here and then trace out the mapping onto the copper side of the board by inserting carbon paper between the map and the copper. The resulting trace is not very distinguishable in dull light so it is suggested that ample light be available for following the carbon paper trace on the copper. Ordinary fast drying enamel paint is an excellent etch resist and can be applied to the trace with an artist's brush. After the paint is dry, the board can be etched and then drilled with a number 64 drill bit. The size of this bit is of course not critical, but a number 64 is about the right size for resistor and capacitor leads. The small dots in fig. 2A indicate wire holes and the larger ones indicate hardware or crystal socket holes. The correct size bit for these holes is determined by the builder's choice of hardware.

After the circuit board is drilled, fig. 2B indicates the exact holes into which each component or wire is to be mounted and soldered. It is suggested that the transistors be mounted and soldered last so they are not overheated. Care should also be exercised in soldering R_{17}, R_{18}, R_{19} and R_{20} so that excessive heat does not alter their resistance.

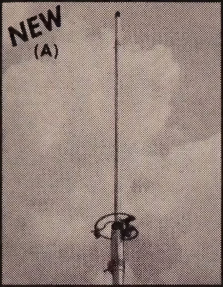
The box used to house the s.w.r. bridge as shown in the photos is a Minibox obtained on the surplus market for 45 cents. It is identical to the familiar Bud miniboxes in construction and measures 6¼ × 3½ × 2 inches. Bud does not manufacture a box to these dimensions, but does make an aluminum chassis with a bottom plate that measures 6 × 4 × 2 inches. Construction using this chassis would be identical to the construction described here and may be even easier since all four sides are attached to the same section. The only component that would have to be mounted on the bottom plate would be the meter. Using the minibox construction, both the meter and R_{16} are mounted on the cover. The equivalent chassis and bottom plate to the Minibox are available as Bud number AC431 and BPA1505, respectively.

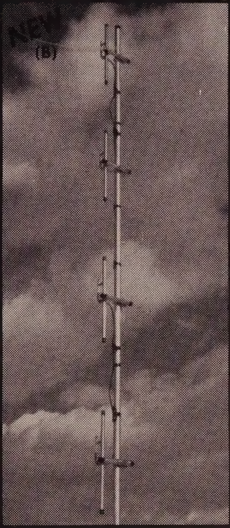
General layout of hardware and components not mounted on the circuit board can be seen in the uncovered view photo.

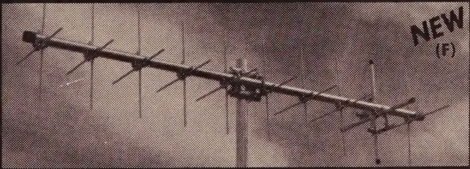
The inductors T_1, T_2 and T_3 as used by the author are on tiny toroid cores (Indiana General CF-101 Q2 material) that are suitable for use between 1 and 50 mc. More often than not, these cores will not be available to the ham unless he is willing to purchase a minimum order of $25 from the manufacturer. For this reason it may be advantageous to use solenoid type coil forms ot say one-quarter inch in diameter. A grid-dip-oscillator can be used to determine resonance at the frequencies listed above. The links (terminals 3 and 4) should have about the same number of turns, *i.e.*, 3, 4, and 5 turns for 10, 15, and 20 meters, respectively and should be wound on the ground or cold end of the solenoid coil between terminals 1 and 2. C_2, C_5 and C_8 should be the same regardless of the type of coil form or core used.

Operation and Bridge Calibration

If the antenna feedpoint is equipped with a SO-239 female coaxial socket, connect the antenna to J_2 by means of a short length of coaxial cable with two male connectors. The impedance of the short coax is not important if the length is at most one foot long or so.







Cush Craft

2 METER ANTENNAS FM

A GREAT BUY FROM ARROW —

(A) FM RINGO 3.75 db GAIN: The most popular — high performance, half-wave FM antenna. Gives peak gain, and efficiency, instant assembly and installation.

AR-2	135-175 mhz	**$12.50**
AR-6	50-54 mhz	**18.50**

(B) 4 POLE: A four dipole array with mounting booms and coax harness 52 ohm feed up to 9 db gain.

AFM-4D	146-148 mhz	**$42.50**

(C) FM MOBILE 3 db GAIN: Fiberglass ⅝ wave professional mobile antenna for roof or trunk mount. Superior strength, power handling and performance.

AM-147		**$26.95**

(D) 11 ELEMENT YAGIS 13.2 db GAIN: The standard of comparison in VHF communications, now cut for 2 meter FM and vertical polarization.

A147-11	146-148 mhz	**$17.95**
A449-11	440-450 mhz	**13.95**

(D) POWER PACK 16 db GAIN: A 22 element, high performance, vertically polarized FM array, complete with all hardware, mounting boom, harness and 2 antennas.

A147-22	146-148 mhz	**$49.50**

(E) 4 ELEMENT YAGI 9 db GAIN: A special side mount 4 element FM yagi can be fixed or rotated—good gain and directivity.

A144-4	146-148 mhz	**$ 9.95**

(F) FM TWIST 12.4 db GAIN: A Cush Craft exclusive — it's two antennas in one. Horizontal elements cut at 144.5 mhz, vertical elements cut at 147 mhz, two feed lines.

A147-20T	145 mhz and 147 mhz	**$39.50**

Rockland County Hams - Visit our Nanuet Store for great Local Service

Dept. D

ARROW ELECTRONICS, INC.

NEW YORK CITY, N.Y. 10007, 97 Chambers Street, 212-349-4411, Between Broadway and Church Street
BAYSIDE, QUEENS, N.Y. 11361 207-02 Northern Blvd., 212-423-0910, Half Block East of Clearview Expressway
NANUET, N.Y. 10954 195 West Route 59, Half Mile East of Thruway Exit 14
FARMINGDALE, L.I., N.Y. 11735 900 Route 110, One Mile South of Republic Aviation
MINEOLA, N.Y. 11501 525 Jericho Turnpike, One Half Block East of Herricks Road
TOTOWA, N.J. 07511 225 Route 46, 201-256-8555
NORWALK, CONN. 06850 18 Isaac Street, Shopping Pl., 203-838-4877

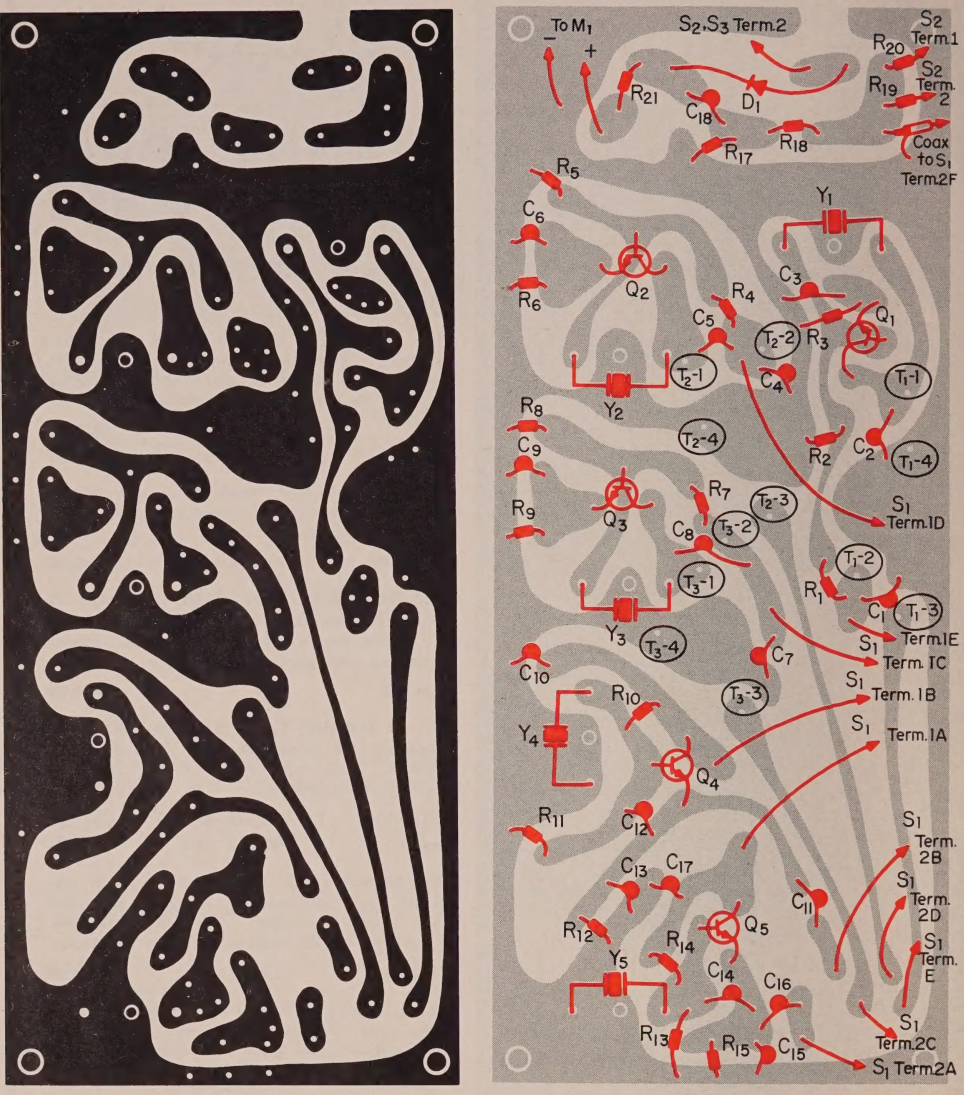
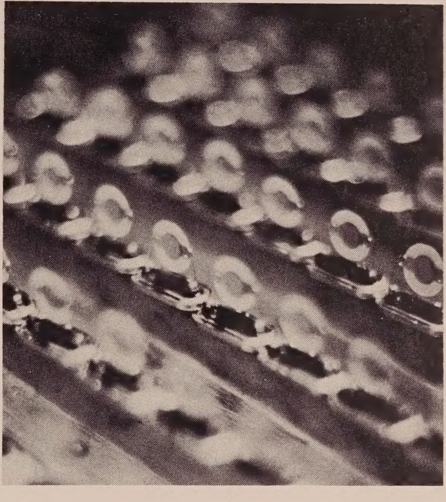

To M_1
–
+
S_2,S_3 Term.2
S_2 Term.1
R_{20}
S_2 Term. 2
R_{19}
R_{21}
C_{18}
D_1
R_{18}
R_{17}
Coax to S_1 Term.2F
R_5
C_6
Y_1
Q_2
C_3
R_6
R_4
C_5
T_2-2
R_3
Q_1
T_2-1
C_4
T_1-1
R_8
Y_2
T_2-4
C_9
R_2
C_2
T_1-4
R_7
T_2-3
R_9
Q_3
C_8
T_3-2
S_1 Term.1D
T_1-2
T_3-1
R_1
C_1
T_1-3
Y_3
T_3-4
S_1 Term.1E
C_7
S_1 Term. 1C
C_{10}
R_{10}
T_3-3
S_1 Term. 1B
Y_4
S_1 Term.1A
Q_4
R_{11}
C_{12}
S_1 Term. 2B
C_{13}
C_{17}
S_1 Term. 2D
C_{11}
R_{12}
Q_5
R_{14}
S_1 Term. E
Y_5
C_{14}
C_{16}
S_1 Term.2C
R_{13}
R_{15}
C_{15}
S_1 Term2A

Fig. 2—Actual size circuit board layout for the s.w.r. bridge built-in signal source and parts layout for the circuit board. Component numbers shown correspond to those in fig. 1.

(A longer length than this would defeat the purpose of the bridge). I prefer to use a double male connector such as Dow-Key AF-2 but this adaptor may not be available. If the antenna transmission line is normally connected to the antenna by bolts or some other means, then obviously only one male coax connector is needed to plug into the bridge. After the bridge is connected to the antenna, select the proper antenna impedance (corresponding to the impedance of the transmission line to be used after tune-up) by sliding S_2 to the appropriate position, *i.e.*, either 50 or 75 ohms. Slide S_3 to the NO TEST position and turn S_1 to the frequency to which the antenna is to be tuned. R_{16} should now be adjusted for a full scale meter reading. After this adjustment, slide S_3 to the TEST position and tune the antenna for minimum meter indication. The s.w.r. of the antenna is 1:1 when the meter indicates zero which in turn

[*Continued on page 99*]

People who know about quality know about Sentry



From South Africa to the Hawaiian Islands, you'll find Sentry crystals. The personal choice of both amateurs and professionals.

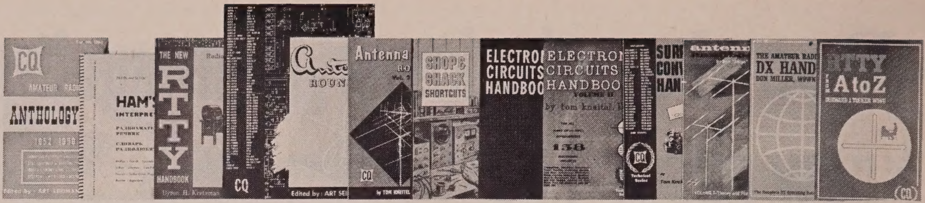
You'll also find us as standard equipment in the best of radios, and wherever quality, dependability and service are important. If these are important to you then specify Sentry crystals.

Today, more and more people are turning to Sentry. That's because we take extra care to make sure when you buy crystals from Sentry you "Buy the Best".

If you haven't received a copy of our new 1971 Catalog of Precision Quartz Crystals and Electronics for the Communications Industry send for your copy today.

"Buy the Best"

SENTRY MANUFACTURING COMPANY
Crystal Park, Chickasha, Oklahoma 73018
PHONE: 405-224-6780 / TWX 910-830-6925



CQ BOOK SHOP

Ham's Interpreter

This valuable book is imported from Germany and written by DL1CU. It contains a collection of phrases and expressions designed to assist those amateurs who wish to enlarge their knowledge of various languages for use on amateur radio. It is a must for every DX'er. $1.50

CQ Binders

Convenient and economical are the words for CQ's beautiful maroon and gold binders. Individual issues can be removed quickly and easily without damage to the magazine. Save precious time as reference copies are within immediate reach in this handy binder. $5.00

The New RTTY Handbook

A treasury of vital and "hard-to-get" information, this book is loaded with valuable equipment schematics, adjustment procedures, etc. A boon to beginner and pro. A special section on getting started, written by Byron Kretzman, W2JTP, a well-known authority in the field. $3.95

Surplus Schematics

Ken Grayson has loaded this book with schematics for currently popular pieces of conversion gear, making it invaluable to amateurs as a guide to surplus gear. $2.50

Antenna Roundup I

Edited by Art Seidman, a 160 page mass of antenna information directed at answering a multitude of questions surrounding the mysterious antenna. $3.00

Antenna Roundup II

Ten big theory articles backed up by 82 detailed and illustrated construction projects from VLF to microwave, long wires to 17 element beams and Sterba Curtain arrays. $4.00

Shop & Shack Shortcuts

A volume packed with hundreds of hints & shortcuts collected by Don Stoner, this will help anyone to dress up his shack, improve shop techniques and increase efficiency and equipment. $3.95

CQ Anthology II

1952-1959 250 pages of more recent but still hard-to-get important articles from glorious yesteryear. $3.00

Electronic Circuit Handbook I

Written by Tom Kneitel, WB2AAI, this details 150 of the most often needed circuits in 11 great chapters. Invaluable for beginners and old-timers alike. $3.00

Electronic Circuit Handbook II

Tom Kneitel's own sequel to Vol 1, this volume delivers 159 additional circuits that will appeal to all amateurs. Each circuit is fully described in text with complete schematics. $3.00

Surplus Conversion Handbook

Compiled by Tom Kneitel, WB2AAI, this contains 192 pages of conversion articles, covering almost every piece of surplus gear worth the effort to convert to ham use. $3.00

Antenna Handbook I

All new information on transmission line theory, Attenuation, Impedance, Standing waves, Resonant and nonresonant lines, current distribution, free space 3 dimensional patterns of long wires of all practical length and much, much more by Ken Glanzer. $4.00

The New DX Handbook

Don Miller's 200 pages of valuable technical information and operating aids, most of which has never been published before and can be found in no other volume contains Great Circle Bearing Charts. $5.00

RTTY From A To Z

This new RTTY Classic has been produced to fill the gaps in RTTY knowledge among amateurs and professionals alike. 16 chapters and 224 pages. This book is a must in your technical library. $5.00

103 - Simple Transistor Projects

The aim of this book is to familiarize the beginner and advanced experimenter with the handy source of reference circuits. $2.95

☐ CQ Anthology II $3.00
☐ Ham's Interpreter $1.50
☐ CQ Binders $5.00
☐ New RTTY Handbook $3.95
☐ Surplus Schematics $2.50
☐ Antenna Roundup I $3.00
☐ Antenna Roundup II $4.00
☐ Shop & Shack Shortcuts $3.95
☐ Electronic Circuits Handbook I $3.00
☐ Electronic Circuits Handbook II $3.00
☐ Surplus Conversion Handbook $3.00
☐ Antenna Handbook I $4.00
☐ New DX Handbook $5.00
☐ RTTY From A To Z $5.00
☐ 103 - Simple Transistor Projects ... $3.45

NAME______________________________

ADDRESS______________________________

CITY______________________________

STATE____________________ ZIP____________

New York City and State residents must add sales tax applicable to your area.

COWAN PUBLISHING CORP. Book Div.
14 Vanderventer Avenue • Port Washington, L.I., N.Y: 11050

DX

BY JOHN A. ATTAWAY,* K4IIF

The WAZ Program

S.S.B. WAZ

851......WAEEO
852......JA1AAT
853......W1DNZ
854......DK2BI
855......WA9NHQ
856......W3HP
857......CO2FA
858......VK3JW
859......DJ1CG

C.W.—Phone WAZ

3113......WA3KSQ
3114......JA2HNP
3115......SP5BCT
3116......K0BEA
3117......PY5ATL
3118......WA9WXL
3119......W8LBM
3120......OE3HOW
3121......F2QQ
3122......I1AND
3123......W9MCR
3124......JA8GR
3125......W8SH
3126......W6ANB
3127......K6YRD
3128......JA3BSD
3129......CO2FA
3130......YU1NEO
3131......DK3PO
3132......W9GHO
3133......LA9DL
3134......YU3DZ
3135......YO2BB

Phone WAZ

453......CO2FA
454......CX3BH

Complete WAZ rules shown on pgs. 64-66 of the June, 1970 issue. Application blanks and reprints of the rules may be obtained by sending a self-addressed, stamped envelope to DX Editor, P.O. Box 205, Winter Haven, Fla. 33880.

As most stateside readers are now aware, the FCC has released a Notice of Proposed Rule Making, Docket No. 19162, which has profound implications for DXers both in the US and abroad. This is the matter of expanded phone frequencies for US licensees, which the Commission broadened to include major changes in the c.w. bands as well. Complete details were published last month so we will briefly discuss some of its effects on DXing.

If adopted by the Commission, this docket will establish a phone sub-band from 14150-14175 kc for US holders of the amateur extra class license, and a 14175-14250 kc sub-band to be shared by Extra and Advanced Class licensees. This will result in the shift of major split frequency DXpedition operation to a point below 14175 in order to escape QRM which will cover the traditional 14195 kc stronghold. A similar situation will exist on 15 meters where 21200-21225 and 21225-21350 kc sub-bands are proposed. While a similar arrangement is suggested for 10 meters, the effect will be less pronounced on this spacious band.

Of great interest is the possibility of a phone sub-band from 7075-7100 kc for DX contacts with other regions. This, along with a proposed 7175-7225 kc sub-band would completely revolutionize phone DXing on 40 meters for Extra and Advanced Class operators.

It is interesting to note that the proposal acknowledges the popularity of DXing by its statement in paragraph 8 that the greater possibility of establishing foreign contacts should be an incentive to qualify for the Extra class license. However, it also seems to acknowledge the general unpopularity of the Extra class license concept in both stating that the modest number of US licenses of this class should not significantly affect foreign telephony operation in the new 25 kc sub-bands, and in reducing the Extra class c.w. sub-bands to only 10 kc each.

Readers of long standing will recall that De Extra's petition, RM-1393, suggested that 10 kc would suffice for the Extra class c.w. bands. However, the Commission felt at that time that more frequencies were necessary as an incentive. Unfortunately its not a matter

John C. Kanode, W4WSF, CQ DX Committeeman representing the Potomac Valley Amateur Radio Club. John was first licensed in 1952 and has held several other calls including K5UYF, KZ5II, HP1XWS, and WA3LYN. He holds over 500 awards including WAZ, all 4 WPX awards, and the CQ C.W. and S.S.B. DX Awards.

---

*P.O. Box 205, Winter Haven, Fla. 33880

WPX HONOR ROLL

The WPX Honor Roll is based on confirmed current prefixes which are submitted by separate application in strict conformance with the CQ Master Prefix List. Scores are based on the current prefix total regardless of an operators all-time prefix count.

MIXED

W4OPM	Joe Hiller	1050
W8LY	Michael Bakos	822
W9WHM	John Leary	811
K1SHN	Chuck Banta	783
VE3GCO	Garry Hammond	777
G3DO	D.A.G. Edwards	773
W3PVZ	Joseph M. Olnick	747
K0BLT	Frank Cahoy	733
W8ROC	Frederick Riecks	729
I1SF	Serafino Franchi	720
W0AUB	Bill Bergmann	719
W4IC	George A. Mack	707
YU1AG	Djura Borosic	703
W4BQY	G. B. Fisher	701
WA5LOB	James Edwards	699
CT1LN	Paulo J. S. Coelho Vierra	693
WA6EPQ	Larry Brockman	650
PY4AP	"Biu" Marra	633
W8KSR	Jon Hodgin	609
W4CRW	Robert C. ommer	604
WA0CPX	Edward C. Gray	600
W8GMK	John Marhefka	592

SSB

W4OPM	Joe Hiller	950
W4NJF	Gay Milius	882
DL9OH	Karl Muller	741
W9DWQ	Edward Goodbout	741
DL1MD	Heribert Rechl	700
HP1JC	Juan G. Chen	698
WA5LOB	James Edwards	692
K2POA	Arthur Johnson	683
G3DO	D. A. G. Edwards	680
I1AMU	Alfonso Porreta	657
K1SHN	Chuck Banta	654
F2MO	Michel Dort	632
W3DJZ	Arden B. Hopple	620
W4IC	George A. Mack	609
W0YDB	W. C. Higgins	603
I1KDB	Giampaolo Nucciotti	599
W6YMV	Paul Friebertshauser	553
I1LCK	Armenghi Franco	549

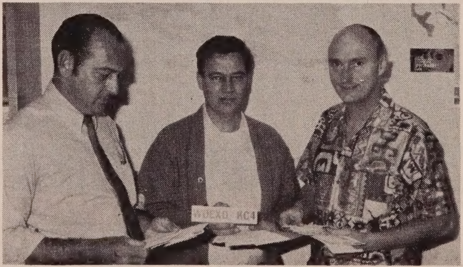
CW

W4OPM	Joe Hiller	900
W8KPL	William Simpson	816
W8LY	Michael Bakos	786
DL1QT	Helmut Baumert	780
W2AIW	Charles W. Rodgers	776
VK3AHQ	Henry Denver	753
W2HO	W. Vollkommer	720
ON4QX	Bob Berge	682
W9FD	W. W. Johler	680
WB2FMK	Robert J. Rasche	659
K1SHN	Chuck Banta	636
G2GM	F. D. Cawley	627
YU1AG	Djura Borosic	613
VE4OX	D. E. McVittie	600
I1SF	Serafino Franchi	588
W8GMK	John Marhefka	562
OK2QX	Ing. Jiri Pecek	556
K1LWI	Wendell Boyden	550

PHONE

W9WHM	John R. Leary	813
G3DO	D. A. G. Edwards	761
CT1LN	Paulo J. S. Coelho Vieira	657
W3DJZ	Arden B. Hopple	654
CX2CN	Samuel C. Barreiro	624
I1SF	Serafino Franchi	595

of incentive, its the existence of a meaningless class of license. Our next painful prediction is that unless the requirements for the Extra class license are made more significant it will die a natural death. Although we opposed incentive licensing editorially, we would hate to see the complete demise of the Extra class as it could contribute to the improvement of the service if it recognized the truly outstanding ham, rather than just a guy who memorized some more questions and slightly increased his code speed.



Here are the boys who operated W0EXD/KC4 from Navassa Island a few weeks ago. Left to right are Carroll Hixon, K4QGM, John Bowman, W4OHP, and Dick Brown, W0EXD. QSL to Rt. 1, Box 716, Pensacola, Fla. 32507.

In a final order adopted Feb. 24, 1971, the Commission amended the 160 meter subbands in the western U.S. This will certainly require changes in next winter's trans-Pacific tests as U.S. amateurs along the west coast are now excluded from all 160 meter band frequencies above 1900 kc.

De Extra

The October, 1970 issue of *OHM,* the Oriental Ham Magazine, carried an article entitled "Honor Comes First" by Fred Laun, HS5ABD. Fred discussed some of the problems of DX with particular stress placed on the over-emphasis on Honor Roll standing, and concluded with some suggestions for improving the procedure for country awards. While space prevents us from using the entire article, we do feel that his suggestions have merit. They are:

The WPX Program

S.S.B. WPX

590......W3YHR
591......W4UPJ
592......DK2BM
593......K4BBK
594......WA8TDY
595......K9BJM

C.W. WPX

1087......PY2DBU

Mixed WPX

269......PY4AP

Phone WPX

206......ZE1BP

WPX Endorsements

S.S.B.: W4IC–650, DK2BI–600, W0YDB–550, WA6AHF–500, K4BBK–250, K3-TVE–250, KC6WS–250, and W2BHK–250.

C.W.: W8KPL–950, DL1QT–800, G2GM–700, YU1AG–700, SM7TV–700, OK2-DB–650, DL7MQ–500, W9EVO–350, and DJ2IF–350.

Mixed: K1SHN–800, YU1AG–800, W4-BQY–750, PY4AP–650, VE3AAZ–600, 4X4FU–500, and WB4KZG–450.

Phone: CT1PK–950, OE2EGL–550, K2-OLG–450, and ZE1BP–400.

15 Meters: W4WSF.

10 Meters: VE3GCO, DK2BI, and W4WSF.

Africa: VE3GCO and YU1SF.

Europe: DJ2IW.

Oceania: K6TZX.

South America: DK2BI.

Complete rules for WPX, WPNX, and VPX may be found on pgs. 66-67 of the June, 1970 issue. Application blanks and reprints of the rules may be obtained by sending a self-addressed, stamped envelope to Award Manager, P.O. Box 1271, Covina, Calif. 91722, or to the DX Editor.

1. The Honor Roll, as such, should be eliminated. Amateurs should be given the basic award plus stickers when they reach the 200 and 300-country levels.
2. No country should qualify for DXCC status unless it is (a) above water 24 hours a day and (b) has at least one long-term inhabitant who is not associated with amateur radio.
3. No foreign amateur should operate in any country where the local inhabitants are not permitted to operate.
4. An amateur on a DXpedition should make every attempt to seek out and spend time with the local amateurs. He should attempt to determine how he might help them improve their equipment or get on the air, and also increase the native amateur population.

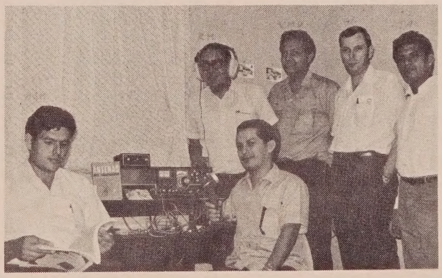
Alex, 3B7DA, was the first station to use the 3B7 prefix. His rig is a Heath HW-16 modified to 40, 20, and 15 meters by VQ9CC and VQ8-CM and presented to the Mauritius Amateur Radio Society by the Southern California DX Club. Alex made over 3000 qso's with the transceiver. *(Photo via WA6GLD)*

OHM followed Fred's article with a letter from an unidentified amateur writing in regard to the editor's proposed trip to Spratly Island. The letter writer noted that propagation between Spratly and his QTH would be poor to lousy, so to insure that he got the QSL he needed, he had attached a check for $50.00. What better evidence of the need to seriously consider Fred's proposals!

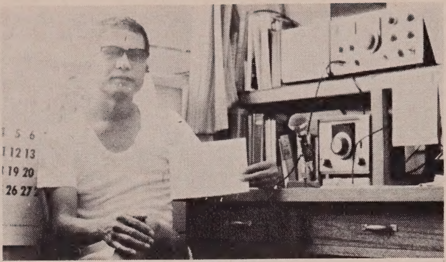
Checkpoint News

We are pleased to announce that Rod Linkous, W7YBX, President of the Western Washington DX Club, is not a member of the *CQ* DX Awards Advisory Committee. Rod can verify QSL cards for DXers in the Seattle area who wish to apply for WAZ and the new *CQ* C.W. and S.S.B. DX Awards. Welcome aboard Rod. We're very happy to have a Committeeman from the Great Northwest.

Also on the west coast, Bob Vallio, W6-



Anyone who thinks ham radio isn't popular in Central America should check with this active Nicaraguan group shown here in the shack of YN1HSM. Left to right are Arturo, YN1HSM; Alberto, YN1AJP (seated); Reinerio, YN1RM (with headphones); Victor, YN1VMD; Alan, YN1-AL; and Tomas, YN1TAL.



One of the kingpins of North Pacific DXers is Itaru Osoegawa, JD1ABO, on Marcus Island. Itaru uses a Kenwood TS 511 and VFO. *(Photo courtesy WA6AUD)*

RGG, has resigned from the committee, but his replacement is none other than Dave Baker, W6WX, a 2-year veteran of the committee, so things in the Bay Area continue to be in good hands. Good luck Bob and welcome back Dave.

QRP—QRPP News

As most DXers like to work toward meaningful certificates many of you will be interested in the awards sponsored by the QRP Amateur Radio Club International. The Award Manager for these toughies is Hugh F. Aeiker, WA8CNN, 929 South Park, Charleston, West Virginia 25304.

The CQ DX Award Program

C.W. DX

26......W4ZYT
27......KL7CZ
28......W9ED
29......W0AO
30......W8BQV
31......K0ARS

S.S.B. DX

50......KH6BB
51......K4GXO
52......W0GYM
53......W3NKM
54......W6ANN
55......W6KZS
56......W0AO
57......XE1AE
58......XE2YP
59......YS1O
60......XE1HS
61......CO2FA
62......DL1YA
63......WA2EOQ
64......W2IOZ
65......DK2BI
66......WA3JZR
67......WA6MWG
68......W4OPM
69......OE2EGL
70......W9KRU
71......W2BHK
72......K6RF
73......DL3VX
74......WA2FLA
75......W4WWD
76......W2ZPO
77......W8ZOK
78......ZL1AGO
79......K4RTA

Complete rules for the CQ DX Award Program may be found on pg. 58 of the January, 1971 issue. Application blanks and copies of the rules may be obtained by sending a self-addressed, stamped envelope to the Award Manager, P.O. Box 1271, Covina, Calif. 91722, or to the DX Editor.

KM/W, 1000 Miles Per Watt: Issued to any amateur transmitting from or receiving the transmission of a low power station that the great circle distance between both sides, divided by the power input of the low power station, equals or exceeds 1000 miles per watt. Additional certificates may be earned using different bands and modes. To apply send full log data (power at each end, both QTH's, signal reports, band and mode) with either $1.00 or 10 IRC's. All certificates are half price to members of QRP ARC I.

WAS-QRPP: Issued to any amateur for confirmed contacts with each of the 50 states using a power input of 5 watts or less. The award will be issued for confirmation of states in the following steps, 20, 30, 40, 45, and 50. Specially endorsed certificates are available when (a) power input for *both* sides of all contacts was 5 watts or less; and (b) power input of the applicant was less than 1 (one) watt for all contacts. To apply, send QSL's or GCR list including powers with $1.00 or 10 IRC's.

DXCC-QRP: Issued to any amateur for confirmed contacts with low power stations in 100 ARRL countries. Power or QRP rig must be indicated on QSL's and application. This award is available to QRO operators but a special endorsement seal will be added if 2-way QRP was used for all contacts. Again, $1.00 or 10 IRC's. In addition, *Milliwatt* magazine maintains a QRPP Honor Roll for countries worked using very low power. For the latter write Ade Weiss, K8EEG/0, Meckling, S.D. 57044.

QRP ARC I has other awards including a WAC-QRP. For complete info write WA8CNN.

Here and There

DL7FT and three associates plan to activate ZA2RPS again from Albania during the interval June 16—30,, 1971. Simultaneous c.w. and s.s.b. operation is planned using the following frequencies: 14030, 21030, 28030, 14108, 14195, 21235, 21245, and 28620 kc. QSL to DL7FT.

A great time was had by W9UCW, K9-CQV, K8HKB, and W0KUS operating from San Andres during the *CQ* 160 Meter Contest in January. They made 166 contest QSO's using the call W9UCW/HK0. These included 36 states, VE1, VE3, plus KV4FZ, YV1OB, ZD8AY, PJ2VD, HR2HH, VP2BO, OK1-

[*Continued on page 100*]

Propagation

BY GEORGE JACOBS,* W3ASK

A plateau in solar activity which lasted for more than a year appears to have ended, and the present solar cycle has begun to decline again.

The Swiss Solar Observatory at Zurich reports a mean sunspot number of 71.5 for February, 1971. This is the lowest monthly level recorded since mid-1967, and results in a smoothed sunspot number of 100 centered on August, 1070.

June's Forecast

Typical summertime propagation conditions are forecast for the h.f. amateur radio bands during June. Optimum frequencies for DX propagation are expected to be somewhat *lower* during most of the daylight hours, and somewhat *higher* during the late afternoon, early evening and nighttime hours, than they were earlier this year.

Solar activity is expected to decline steadily, with a smoothed sunspot number of 78 forecast for June, 1971. This means that h.f. propagation conditions this summer season will be somewhat below the conditions observed during the summer months of 1968, 1969, and 1970 when solar activity was set at a smoothed sunspot level of approximately 105.

A sharp decrease is expected in DX propagation conditions on 10 meters during June and the summer months. While considerably fewer openings are predicted, some fairly good ones may still take place to some southern and tropical areas of the world during the daylight hours.

Excellent world-wide DX propagation conditions are forecast for 15 meters, with conditions peaking during the late afternoon and early evening hours. The band is expected to remain open well into the hours of darkness to some southern and tropical areas of the world. All-in-all, 15 meters should be the optimum band for DX openings during most of the daylight hours.

While DX openings to one area of the world or another are forecast almost around-the-clock on 20 meters, propagation conditions are expected to peak on this band during the early evening hours and through the hours of darkness. During June and the summer months, 20 meters should be the optimum band for DX openings during the hours of darkness.

With fewer hours of darkness and a sharp seasonal increase in static levels, DX propagation conditions are expected to be poorer on the 40, 80 and 160 meter bands during June than they were earlier this year. Despite these poorer conditions, some fairly good DX openings are forecast for 40 and 80 meters during the hours of darkness and the sunrise period. What little chance there is for a 160 opening should also take place during these same time periods.

LAST MINUTE FORECAST

June, 1971

Days	*Rating & Forecast Quality* (4)	(3)	(2)	(1)
Above Normal: 10, 17-18, 21, 26.			B-C	C
Normal: 1-2, 5, 7-8, 11-13, 15-16, 19-20, 22-23, 25, 28-29.	A-B	B-C	C-D	D-E
Below Normal: 3-4, 6, 9, 14, 24, 30.	C	D	D	E
Disturbed: None.	D	E	E	E

HOW TO USE THESE CHARTS

The following is an explanation of the symbols shown above, and instructions for the use of the *CQ* propagation predictions:

1—Enter Propagation Charts on following pages under appropriate band and distance or geographical area columns. Read predicted times of band openings at intersection of both columns.

2—Following each predicted time of band opening is a forecast rating which indicates the relative number of days the band is expected to open during each month of the forecast period. The higher the rating, the more frequent the opening, as follows: (4) band open more than 22 days each month; (3) between 14 and 22 days; (2) between 8 and 13 days; (1) less than 7 days.

On the "Short-Skip" Chart where two numerals are shown within a single set of parenthesis, the first applies to the shorter distance for which the forecast is made, and the second to the greater distance. Note the forecast rating for later use.

3—With the forecast rating noted above, start with the numbers in parenthese at the top of the "Last Minute Forecast" appearing above. Read down the table for a day-to-day forecast of propagation conditions in terms of Above Normal (WWV rating higher than 6); Normal (WWV rating 5-6); Below Normal (WWV rating 4); Disturbed (WWV rating less than 4). The letter symbols (A-E) describe reception conditions (signal quality, noise and fading levels) expected for each day of the month and have the following meaning: (A—excellent opening with strong, steady signals; B—good opening, moderately strong signals, little fading and noise; C—fair opening, signals fluctuating between moderately strong and weak; D—poor opening, signals generally weak and considerable fading and noise; E—poor opening, or none at all.

4—This month's DX Propogation Charts are based upon a transmitter power of 250 watts c.w.; 1 kw p.e.p. s.s.b., or 1000 watts d.s.b., into a dipole antenna a quarter-wave above ground on 160 and 80 meters a half-wave above ground on 40 and 20 meters, and a wave-length above ground on 15 and 10 meters. For each 10 db gain above these reference levels, reception quality shown in the "Last Minute Forecast" will improve by one level; for each 10 db loss, reception will become poorer by one level.

5—Local Standard Time for these predictions is based on the 24-hour system.

6—The Eastern USA Chart can be used in the 1, 2, 3, 4, 8, KP4, KG4 and KV4 amateur call areas; The Central USA Chart in the 5, 9, and 0 areas, and the Western USA Chart in the 6 and 7 areas. The Charts are valid from June 15, 1971 through Aug. 15, 1971 and are prepared from basic propagation data published monthly by the Institute For Telecommunication Sciences of the U.S. Dept. of Commerce, Boulder, Colorado.

---

*11307 Clara Street, Silver Spring, Md. 20902

This month's *CQ* Propagation Charts contain DX predictions for the period June 15 through August 15, 1971. Short-skip predictions for June, for distances between 50 and 2300 miles, and from Hawaii and Alaska to the mainland, appeared in last month's column. Instructions for the use of this month's DX Charts may be found directly below the "Last Minute Forecast" which appears at the beginning of this column.

V.h.f. Ionospheric Openings

Sporadic-E short-skip propagation should reach a seasonal peak during June, and this is expected to result in fairly frequent 6 meter openings over a range of 1000 to 1400 miles. During periods of widespread ionization, two-hop 6 meter openings may occasionally be possible up to distances of approximately 2300 miles. An occasional 2 meter short-skip opening, between approximately 1200-1400 miles, may also be possible during periods of intense sporadic-E ionization. Short-skip openings are most likely to occur between 9 A.M. and 1 P.M. and again between 5 P.M. and 9 P.M. local standard time, although they can take place at all other times as well. Refer to "V.h.f. Ionospheric Propagation", appearing in the November, 1969 issue of *CQ* (page 37), for a do-it-yourself method for predicting v.h.f. sporadic-E short-skip openings.

No major meteor showers are forecast for June, and very little auroral activity is expected. Check the "Last Minute Forecast", since whatever auroral propagation may be possible during June is most likely to occur on those days forecast to be below normal or disturbed.

Trans-equatorial (TE) scatter propagation is expected to fall off considerably during June, but an occasional opening might be possible between 8 and 11 P.M., local standard time, on long north-south paths which cross the geomagnetic equator at approximately right angles. TE openings favor locations in the southern region of the USA, with openings into more northerly areas unlikely during June.

Sunspot Cycle Info

The Swiss Federal Solar Observatory at Zurich recently published the definitive, or official sunspot numbers for 1970. These are the final values which will be entered into scientific record books, and they appear below.

Official Zurich Monthly
Mean Sunsot Nubers
For 1970

Jan.	115.5	July	112.5
Feb.	127.8	Aug.	93.0
March	102.9	Sept.	99.5
April	109.5	Oct.	86.6
May	127.5	Nov.	95.2
June	106.8	Dec.	83.5

The highest level of solar activity recorded during 1970 took place on April 10th, when the daily sunspot number reached 188. The lowest level was recorded on March 29, when the daily sunspot number dipped to 29.

The annual mean sunspot number recorded for 1970 was 104.5. This is close to the peak annual mean of the present cycle which was recorded during 1968 at a level of 105.9, and the mean value of 105.5 recorded during 1969. This is another statistical indication of the practically constant level of solar activity that occurred during the period 1968-1970.

The definitive numbers alter only slightly the monthly smoothed sunspot numbers reported in this column during the past year. The table of smoothed numbers shown in "Sunspot Cycle 20 —Progress 1970; Prediction 1971" (Table *1*, page 46, *CQ* Jan. 1971) can be revised as shown below.

Smoothed Sunspot Numbers
Figures in italics are predicted values; all others are observed.

	1969	1970	1971
January	110	106	*90*
February	110	106	*87*
March	108	106	*85*
April	106	106	*82*
May	106	106	*80*
June	106	106	*78*
July	106	104	*76*
August	106	100	*74*
September	105	(98)	*72*
October	104	(96)	*70*
November	105	(94)	*68*
December	105	(92)	*66*

June 15—August 15, 1971

Time Zone: EST (24-Hour Time)

EASTERN USA TO:

	10 Meters	*Meters 15*	*20 Meters*	*40/80 Meters*
Western & Central Europe & North Africa	*Nil*	07-08 (1) 08-11 (2) 11-14 (1) 14-17 (2) 17-19 (1)	08-13 (1) 13-14 (2) 14-16 (3) 16-21 (4) 21-00 (3) 00-04 (2) 04-06 (3) 06-08 (2)	19-21 (1) 21-22 (2) 22-00 (3) 00-01 (2) 01-02 (1) 21-23 (1)* 23-00 (2)* 00-01 (1)*
Northern Europe & European USSR	*Nil*	10-13 (1) 13-15 (2) 15-18 (1)	08-14 (1) 14-16 (2) 16-17 (3) 17-20 (4) 20-23 (3) 23-01 (2) 01-06 (1) 06-08 (2)	20-21 (1) 21-23 (2) 21-01 (1) 20-23 (1)*
Eastern Mediterranean & Middle East	*Nil*	10-12 (1) 12-16 (2) 16-17 (3) 17-18 (2) 18-19 (1)	11-13 (1) 13-15 (2) 15-18 (3) 18-22 (4) 22-00 (3) 00-02 (2) 02-05 (1) 05-07 (2) 07-09 (1)	19-21 (1) 21-23 (2) 23-00 (1) 21-23 (1)*

West Africa	10-12 (1) 15-18 (1)	09-11 (1) 11-13 (2) 13-14 (3) 14-16 (4) 16-18 (3) 18-19 (2) 19-21 (1)	13-14 (1) 14-15 (2) 15-17 (3) 17-22 (4) 22-01 (3) 01-03 (2) 03-06 (1)	19-21 (1) 21-23 (2) 23-01 (1)
East & Central Africa	09-11 (1) 15-17 (1)	08-11 (1) 11-13 (2) 13-15 (3) 15-16 (4) 16-17 (3) 17-19 (2) 19-20 (1)	13-15 (1) 15-16 (2) 16-17 (3) 17-20 (4) 20-23 (3) 23-02 (2) 02-05 (1)	20-23 (1)
South Africa	09-12 (1)	07-09 (1) 09-10 (2) 10-12 (3) 12-13 (2) 13-14 (1)	23-00 (1) 00-02 (3) 02-04 (2) 04-07 (1) 12-13 (1) 13-15 (2) 15-17 (1)	20-21 (1) 21-23 (2) 23-01 (1) 22-00 (1)*
Central & South Asia	*Nil*	08-10 (1) 13-18 (1) 18-21 (2) 21-22 (1)	16-19 (1) 19-22 (2) 22-02 (1) 02-05 (2) 05-07 (1)	18-20 (1)
Southeast Asia	*Nil*	09-12 (1) 15-18 (1) 18-20 (2) 20-21 (1)	05-06 (1) 06-08 (2) 08-10 (1) 15-18 (1) 18-20 (2) 20-23 (1) 23-01 (2) 01-02 (1)	*Nil*
Far East	*Nil*	09-11 (1) 15-17 (1) 17-19 (2) 19-21 (1)	05-06 (1) 06-08 (3) 08-09 (2) 09-11 (1) 17-19 (1) 23-01 (1)	*Nil*
South Pacific & New Zealand	14-17 (1) 17-19 (2) 19-21 (1)	08-10 (1) 13-15 (1) 15-18 (2) 18-22 (3) 22-23 (2) 23-00 (1)	17-20 (1) 20-22 (2) 22-00 (3) 00-03 (4) 03-04 (3) 04-06 (2) 06-08 (3) 08-09 (2) 09-11 (1)	00-02 (1) 02-05 (2) 05-07 (1) 03-05 (1)*
Australasia	18-20 (1)	08-10 (1) 16-17 (1) 17-19 (2) 19-21 (3) 21-22 (2) 22-23 (1)	22-00 (1) 00-02 (2) 02-04 (3) 04-07 (2) 07-09 (3) 09-11 (2) 11-13 (1)	02-03 (1) 03-05 (2) 05-06 (1) 03-05 (1)*
Northern & Central South America	10-13 (1) 13-15 (2) 15-17 (3) 17-18 (2) 18-19 (1)	07-08 (1) 08-10 (2) 10-15 (3) 15-19 (4) 19-21 (3) 21-23 (2) 23-00 (1)	05-06 (3) 06-08 (4) 08-10 (3) 10-15 (2) 15-17 (3) 17-00 (4) 00-03 (3) 03-05 (2)	20-22 (1) 22-03 (2) 03-05 (1) 22-03 (1)*
Brazil, Argentina, Chile &	10-13 (1) 13-15 (2) 15-17 (3) 17-18 (2)	06-07 (1) 07-10 (2) 10-14 (1) 14-15 (2)	15-16 (1) 16-18 (2) 18-19 (3) 19-00 (4)	23-05 (1) 00-04 (1)*
Uruguay	18-19 (1)	15-16 (3) 16-19 (4) 19-22 (3) 22-00 (2) 00-01 (1)	00-02 (3) 02-04 (2) 04-06 (1) 06-08 (2) 08-10 (1)	
McMurdo Sound, Antarctica	*Nil*	13-15 (1) 15-19 (2) 19-20 (1)	16-18 (1) 18-22 (2) 22-02 (3) 02-06 (2) 06-08 (1)	01-04 (1)

*Predicted times of 80 meter openings. Openings on 160 meters are also likely to occur during those times when 80 meter openings are shown with a forecast rating of (2), or higher.

[*Charts continued on page 94*]

Time Zones: CST & MST (24-Hour Time)

CENTRAL USA TO:

	10 Meters	*Meters 15*	*20 Meters*	*40/80 Meters*
Western & Central Europe & North Africa	*Nil*	10-15 (1) 15-17 (2) 17-19 (1) 22-00 (1)	00-04 (1) 04-06 (2) 06-15 (1) 15-16 (2) 16-17 (3) 17-19 (4) 19-22 (3) 22-00 (2)	19-22 (1) 22-00 (2) 00-01 (1) 21-23 (1)*
Northern Europe & European USSR	*Nil*	08-11 (1) 11-15 (2) 15-17 (1)	01-06 (1) 06-08 (2) 08-14 (1) 14-17 (2) 17-21 (3) 21-01 (2)	19-23 (1)
Eastern Mediterranean & Middle East	*Nil*	12-14 (1) 14-17 (2) 17-19 (1)	12-15 (1) 15-17 (2) 17-21 (3) 21-23 (2) 23-00 (1) 06-08 (1)	20-23 (1)
West Africa	09-11 (1) 15-17 (1)	09-11 (1) 11-14 (2) 14-16 (3) 16-18 (2) 18-20 (1)	13-14 (1) 14-15 (2) 15-17 (3) 17-21 (4) 21-23 (3) 23-02 (2) 02-04 (1)	19-23 (1) 22-23 (1)*
East & Central Africa	15-18 (1)	12-14 (1) 14-15 (2) 15-17 (3) 17-18 (2) 18-19 (1)	14-16 (1) 16-17 (2) 17-19 (3) 19-21 (4) 21-22 (3) 22-00 (2) 00-01 (1)	19-22 (1)
South Africa	09-11 (1)	23-01 (1) 07-09 (1) 09-11 (2) 11-12 (1)	22-23 (1) 23-01 (2) 01-04 (1) 10-12 (1) 12-14 (2) 14-16 (1)	20-22 (1) 22-23 (2) 23-00 (1) 22-00 (1)*
Central & South Asia	*Nil*	14-17 (1) 17-20 (2) 20-22 (1) 08-10 (1)	16-18 (1) 18-21 (2) 21-05 (1) 05-07 (2) 07-09 (1)	*Nil*
Southeast Asia	*Nil*	09-12 (1) 16-18 (1) 18-20 (2) 20-22 (1)	02-06 (1) 06-09 (2) 09-10 (1) 21-22 (1) 22-00 (2) 00-01 (1)	*Nil*
Far East	*Nil*	08-10 (1) 12-14 (1) 17-19 (1) 19-22 (2) 22-00 (1)	00-03 (1) 03-05 (2) 05-09 (3) 09-10 (2) 10-12 (1)	03-04 (1) 04-05 (2) 06-08 (1)
South Pacific & New Zealand	12-17 (1) 17-19 (2) 19-20 (1)	12-15 (1) 15-17 (2) 17-19 (3) 19-21 (4) 21-22 (3) 22-23 (2) 23-00 (1)	16-18 (1) 18-22 (2) 22-00 (4) 00-04 (3) 04-06 (2) 06-08 (4) 08-10 (2) 10-12 (1)	22-00 (1) 00-02 (2) 02-04 (3) 04-06 (2) 06-07 (1) 00-06 (1)*
Australasia	16-20 (1)	13-14 (1) 14-16 (2) 16-18 (1) 18-19 (2) 19-21 (3) 21-22 (2) 22-23 (1)	21-23 (1) 23-00 (2) 00-02 (4) 02-04 (3) 04-06 (2) 06-08 (4) 08-10 (2) 10-11 (1)	00-02 (1) 02-06 (2) 06-07 (1) 03-06 (1)*
Northern & Central South America	10-12 (1) 12-14 (2) 14-16 (3) 16-17 (2) 17-18 (1)	07-08 (1) 08-10 (2) 10-15 (3) 15-18 (4) 18-19 (3) 19-20 (2) 20-22 (1)	02-04 (2) 04-06 (3) 06-08 (4) 08-10 (3) 10-15 (2) 15-17 (3) 17-22 (4) 22-02 (3)	20-22 (1) 22-03 (2) 03-05 (1) 22-04 (1) 23-02 (1)*

Contest Calendar

BY FRANK ANZALONE,* W1WY

Calendar of Events

May	15	World Telecomm. C.W.
May	22	World Telecomm. Phone
May	21-23	YL ISSBers QSO Party
June	4-7	CHC/FHC/HTH QSO Party
June	5-6	Argentina Contest
June	12-13	Oregon QSO Party
June	12-13	ARRL VHF QSO Party
June	13-19	Mass. Amateur Radio Week
June	15-19	Mass. Cities & Towns Contest
June	20	WAB VHF Phone Contest
June	19-20	Bermuda C.W. Contest
June	19-20	Panamerican Games
June	26-27	ARRL Field Day
July	3-4	Venezuela Contest
July	17-18	Colombia Contest
July	24-25	County Hunters C.W. Contest
Aug.	7-8	DARC WAE C.W. Contest
Aug.	28-29	All Asian C.W. Contest
Sept.	11-13	Delta QSO Party
Sept.	11-12	DARC WAE Phone Contest
Oct.	2-3	VK/ZL/Oceania DX Phone
Oct.	9-10	VK/ZL/Oceania DX C.W.
Oct.	9-10	RSGB 28 mc Phone Contest
Oct.	16-17	WADM C.W. Contest
Oct.	23-24	RSGB 7 mc C.W. Contest
Oct.	**30-31**	**CQ WW DX Phone Contest**
Nov.	6-7	RSGB 7 mc Phone Contest
Nov.	7	Czechoslovakia Contest
Nov.	**27-28**	**CQ WW DX C.W. Contest**

CHC/FHC/HTH QSO Party

Starts: 2300 GMT Friday, June 4
Ends: 0600 GMT Monday, June 7

There's a lot involved in this one. I highly recommend you write K6BX for rules sheet and list of many awards in the different catagories. (Include a s.a.s.e.) Here are rules in brief.

Exchange: QSO nr., report, name, CHC/FHC nr., state and county or similar subdivision. Non-members omit nr. and send HTH instead.

Scoring: For CHCers: 1 point per QSO with other CHCers, 2 points if its a HTHer, and 1 additional point if its a YL, B/P, FHC, Novice CHC-200, Merit or Club station. Double above points if QSO is out of own country. For HTHers: Contacts with other HTHers 1 point, with CHCers 3 points, otherwise same as above. The same station may be worked on different bands and modes.

S.w.l. use same scoring system.

Multiplier: Each continent, country ITU Zone and US state (counted only once)

Final score: Total QSO points from all bands × the sum of the multiplier. Multi-operator stations divide score by number of operators used.

Frequencies: 3575, 3710, 7070, 7160, 14075, 21075, 21090, 21140, 28090 on c.w. and 3770, 3775, 3790, 3943, 3960, 7070, 7090, 7210, 7260, 7275, 14320, 14340, 21360, 21440, 28620, 28690, on phone, both US and DX.

Awards: Certificates and Trophies to numerous to mention, get list.

Logs and rules requests and etc. go to: Clif Evans, K6BX, 3212 Mesa Verde Rd., Bonita, Calif. 92002.

Argentina Contest

Starts: 0000 GMT Saturday, June 5
Ends: 2400 GMT Sunday, June 6

The Argentino Radio Club is promoting this international contest in commemoration of its 50th anniversary.

Catagories: Single and multi-operator, all bands, phone or c.w.

Exchange: RS/RST plus number indicating number of years in ham radio.

Scoring: Each LU QSO is worth 3 points, other contacts 1 point. The multiplier is derived from the number of LU states and different countries worked. (Stations in own country may be worked for multiplier only)

Final score: Total QSO points × sum of LU states and countries worked from all bands.

Awards: Certificates and plaques with medal to the highest scoring station in each continent, and 1st place certificates in each country, in both catagories, and for phone and c.w.

Use separate log for each band, check for duplicate contacts and include a summary sheet with scoring information and equipment description. Your name and address in BLOCK LETTERS.

Mailing deadline July 31st to: Radio Club Argentino, LU DX Contest, P.O. Box 97, Buenos Aires, Argentina.

Oregon QSO Party

Starts: 2000 GMT Saturday, June 12
Ends: 0300 GMT Monday, June 14

This year's QSO party is again sponsored by the Portland A.R.C. There are no time or power limits and the same station may be worked on different bands and modes for QSO points.

---

*14 Sherwood Road, Stamford, Conn. 06905

Exchange: QSO nr., RS/RST and QTH. County for Oregon stations, state, province or country. for all others.

Scoring: Each QSO counts 1 point, except on 160 or if its RTTY, then its worth 5 points. Oregon will use state, province and countries for their multiplier, Out-of-state stations use Oregon counties. (max. of 36)

Frequencies: 1975-2000, 3560, 3900, 7060, 7260, 14060, 14280, 21060, 21400, 28060, 28600. Also contacts in the VHF QSO Party that meet requirements of this party.

Awards: Certificates to the high scoring single operator stations outside Oregon, and the top three single-op and multi-operator station in Oregon.

Mailing deadline is June 30th to: Marty Kirk, WA7JMA, 5209 N. Amherst, Portland, Oregon 97203. Include s.a.s.e. for results.

Mass. Amateur Radio Week

Starts: 0001 GMT Sunday, June 13
Ends: 2400 GMT Saturday, June 19

This period has been proclaimed Amateur Radio week by the Governor of Massachusetts. If you fulfill the following requirements you will earn a Certificate signed by the Governor.

1. Mass. work 16 other Mass. stations.
2. New England work 8 Mass. stations.
3. Rest of U.S. work 5 Mass. stations.
4. DX (inc. KH & KL) 2 Mass. Stations.

Exchange will be signal report, country, and state. Certificates will be endorsed for band and mode upon request.

Applications must be received no later than July 31st, include a #10 s.a.s.e. and send to: Bill Holliday, WA1EZA, 22 Trudy Terrace, Canton, Mass. 02021.

Mass. Cities & Towns Contest

Starts: 0001 GMT Tuesday, June 15
Ends: 2400 GMT Saturday, June 19

As part of the activities during the Radio Week, the Mass. Chapter National Awards Club is sponsoring this contest.

Exchange: Signal report, city or town, county and state.

Scoring: One point for each Mass. station worked. And a multiplier for each Mass. city or town. Final score, total Mass. stations worked × sum of cities and towns. (mobiles do not count)

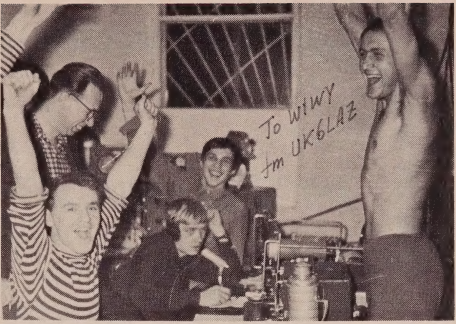
Awards: Certificates to winners in each state and country.

Logs go to: Steven Rich, WA1DFL, 31 Arlington Ave., Revere, Mass. 02151.

Panamerican Games

Starts: 0000 GMT Saturday, June 19
Ends: 2400 GMT Sunday, June 20

This party is organized by the Liga Colombiana de Radioaficionados, Cali section and open to all amateurs in the Pan-American countries only. Activity will be on the 15, 20 and 40 meter bands, single operator, and on phone only.



The boys at UK6LAZ "whooping it up" after they had made the last contact in a USSR contest and broken their record from the previous year. Look for bigger things from this group in future contests, especially the "Big One" October 30-31 and November 27-28.

Exchange: RS plus a 3 figure QSO number.

Scoring: Contacts with station HK5CCP are worth 20 points, with HK5VD 10 points, other HK5 stations 5 points, and all other Pan-Am stations 2 points.

The official station will broadcast information about Cali and participating countries. Include this in your report and earn additional credit in your score.

Awards: There are certificates to stations earning at least 150 points and awards in many other sections and catagories.

Mailing deadline is August 31st to: Cali Concurso Panamericano, (HK5CCP) P.O. Box 6149, Cali, Colombia.

Venezuela Contest

Starts: 0000 GMT Saturday, July 3
Ends: 2400 GMT Sunday, July 4

This is a phone only contest sponsored by the Radio Club Venezolano commemorating the anniversary of Venezuela's independence.

Use all bands 10 thru 80. There are three catagories, single operator, both single and all band, and multi-operator, both single and multi transmitter.

Exchange: The RS report plus a three figure contact number starting with 001.

Scoring: One point per contact, 2 points if it's with a YV station.

Multiplier: For each country, YV call area and USA call area worked on each band.

Contacts: *Stations in Americas:* Work YV's, other American countries and rest of world. *Stations in other continents:* Work YV's and other American countries only.

[*Continued on page 92*]

Q AND A

BY WILFRED M. SCHERER,*
W2AEF

The first question for this month does not strictly involve amateur radio, but since we've received a number of inquiries in a similar vein, it is felt fitting to present this one.

Selectivity on Shortwave Broadcast Bands

Question: Can you help me improve the selectivity of my Collins 51S-1 receiver? This set has a "Q-Multiplier" built in and a 500 kc i.f. I've incorporated the 6 kc Collins mechanical filter which is a field change and aligned it with a sweep generator and scope, yet I do not feel satisfied that it is as good as could be. On the s.w. broadcast bands where the signals are 5 kc apart, even tuning way to the far side at each end of the filter will not permit satisfactory operation.

How about a ceramic filter? Will it be compatible? Will something like Swan's SS-16 crystal filter do any better? I thought the 51S-1 would be the world's best, and it is in stability, resetability and dependability, but not in selectivity. Help please!

Answer: First, for the reader not acquainted with the Collins 51S-1 receiver, this is a sophisticated job with a digital readout and providing general coverage from 2-30 mc. Evidently the inquirer is employing the receiver primarily for s.w. broadcast reception.

In this case the real problem with the interference difficulty apparently is not recognized; namely, that it is due to improper operation of transmitters on these bands, such as excessive modulation, splatter and spurious signals, off assigned frequency or out of tolerance, cross-talk in transmitters located at the same site, etc.

Take for example, the VOA stations, one in particular on 15,330-15,335 kc, which apparently gets out of whack quite frequently and causes splatter over a ±30 kc range even with a 500 c.p.s. filter used in the receiver!

Two or more stations are often found operating on the same frequency (or near it) and will double up on each other with different program material or will produce a heterodyne beat usually noted as a low-frequency growl.

In addition, delay echoes are produced by round-the-world signals or by two transmitters at different sites and carrying the same program material.

No receiver in the world can correct these conditions; as a matter of fact, we have simultaneously listened with six of the best receivers available, none of which satisfactorily coped with these situations. With poorer type receivers, cross modulation and r.f. intermodulation problems can crop up, but this is not a situation likely to be encountered with the 51S-1, as it has excellent signal-handling capabilities.

In the case of splatter, an 800 c.p.s. filter is sometimes helpful to a small degree, but then you lose the high audio frequencies and deteriorate voice intelligibility. The 6 kc filter in the 51S-1 should be okay in this respect, as it will give you ±3 kc selectivity on an a.m. signal. A 2.75 kc filter will give slightly less than ±1.5 kc. A ceramic filter will be of no additional help (these usually are 455 kc jobs anyway) and the Swan crystal filter is not adaptable for 500 kc operation.

Interference problems often can be reduced on a.m. signals by employing the 2.75 kc filter and using the s.s.b. position, and tuning for zero beat with the carrier. A choice may be made made between u.s.b. and l.s.b., whichever is better for reducing adjacent-channel interference. Intelligent use of the notch filter may be of some help, particularly where a heterodyne note is involved. A reduction in r.f. gain also may sometimes be of benefit.

Tapped Loading Coil for Mobile Antennas

Question: I have been told I cannot tap my 75-meter Hustler Antenna coil for 40-meter operation. I note that some commercial mobile antennas and the ARRL *Handbook* have models with the loading coil tapped with a slider. What do you think?

Answer: The loading coil for the Hustler 75-meter antenna may be tapped for 40.

[*Continued on page 87*]

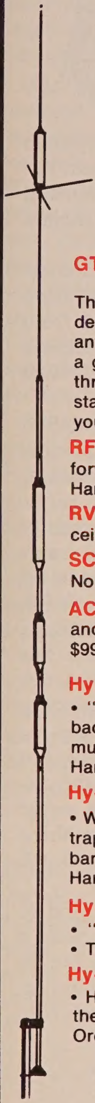
---

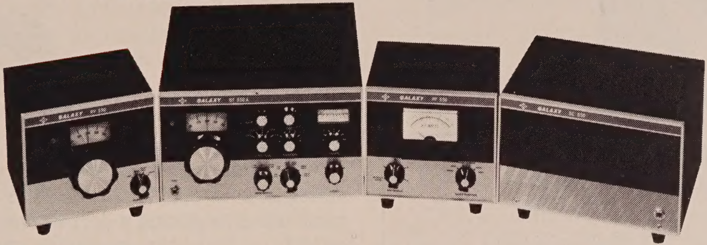
*Technical Director, *CQ*.

The most powerful signals under the sun!

THE GALAXY 550A

MORE POWER, MORE FLEXIBILITY FOR THE Fixed Station...





GT-550A Transceiver Order No. 800 Ham Net $550.00

The GT-550A is the best transceiver on the market for the money. Bar none. Costs just $550 and delivers 550 watts of power. Operating either fixed station or mobile, this transceiver is guaranteed to have a top frequency stability after warm-up. We're so proud of the stability we include a graph with each GT-550A showing the purchaser how stable his radio was when it went through final check. 550 watts SSB; 360 watts CW; sensitivity better than .5 uv for 10db S+N/N; stable—45db carrier suppression; 25 KHz calibrator and vox option; no frequency jump when you switch sidebands.

RF550 contains high accuracy watt meter; calibrated in 400 and 4,000 watt scales; switch for forward or selected power; switch to select 5 antennas or dummy load. Order No. 805
Ham Net $75.00

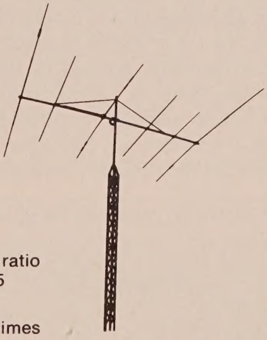
RV550 is a solid state VFO. Function switch selects the remote unit to control Receive-Transceive-Transmit frequency independently. Order No. 804 Ham Net $95.00

SC550 Speaker Console with headphone jack. AC400 power supply will mount inside. Order No. 803 Ham Net $29.95

AC400 Power Supply is heavy duty solid state to operate GT-550A at full power, on SSB or CW, and with switch selection of 115/230 VAC, 50/60 Hz input voltages. Order No. 801 Ham Net $99.95.

Hy-Gain's *Super Thunderbird* TH6DXX

• "Hy-Q" Traps • Up to 9.5db forward gain • 25db front-to-back ratio • SWR less than 1.5:1 on all bands • Takes maximum legal power • 24-foot boom. Order No. 389
Ham Net $179.95



Hy-Gain's 18 AVT/WB

• Wide band performance, 80 through 10 meters • Three Hy-Q traps • Top loading coil • True 1/4 wave resonance on all bands • SWR of 2:1 or less at band edges. Order No. 386
Ham Net $59.95

Hy-Gain's Thunderbird TH3Mk3 (not shown)

• "Hy-Q" traps • Up to 8db forward gain • 25 front-to-back ratio • Takes maximum legal power. Order No. 388 Ham Net $144.95

Hy-Gain's 400 Rotator/Indicator

• Handles large beams and stacked arrays with ease—up to 10 times the mechanical and braking capability of any rotator on the market. Order No. 400 Ham Net $189.95

Call Bob Douglas

DOUGLAS ELECTRONICS

1401 Blake Corpus Christi, Texas Phone 303-244-5523

THE awards PROGRAM

BY ED HOPPER,* W2GT

Special Honor Roll
All 3079 Counties!
#51–John P. Nelson, W6JHV, 2-24-71.
#52–Roy C. Needham, ZL1KG, 3-3-71
1st to non-K/W/WA station!
(See Story and Foto Dec. '70 CQ)

THE June, "Story of The Month" is:

Clyde W. Stottlemyre, W0YLN
All Counties #39, 9-12-70

Clyde was a radio operator with the Navy 1943-1946 and learned the code and some theory in the Navy's radio operators course. Joined the Army in 1950 and in 1954 wound up as NCOIC of Hqts. Army Mars station in the Pentagon–so was more or less forced into getting a ham ticket, General Class in 1954. Liked c.w. over fone and 1st call was W0YLN and while in D.C. area (5 years) got W3HEO, then got W0YLN again when sent to Ft. Leavenworth, Kansas in 1966.

Clyde has been in 43 different countries, at one time or another, including Okinawa, Iran, Japan and Greece, and operated from a few a KR6MM, EP2MM and SV0WX. He tried to get permission to operate from each country, but did not have much success. Almost got on from Turkey in 1959-1960, and came close to getting a permit from Vietnam in 1953.

He did win the *CQ* WWDX CW Contest from Okinawa in 1965 on 20 and also from Iran in 1967. It was fun in the contests from the DX locations but rough from Kansas due to the big guns on the East and West coasts.

Clyde retired from the U.S. Army in 1968 as MSG E-8 in the Signal Corps, and now works for Antenna's Inc., in Leavenworth, Kansas in sales and engineering.

He ran across the Independent County Hunter Net by accident and got real interested as he has always had a mobile rig in his car and this was a great way to be useful, have fun, and get credit for it. As most know, he really plunged into the game and has never felt sorry as the quest for the USA-CA Award has not only been the most interesting thing he has done, but was the reason for meeting the finest gang of people ever, not only on the air but also in person at the different conventions. He feels that he never ran across any other Net, Club or anything that promotes as much fellowship, good-will and interest, as the ICHN.

Another big attraction is the fact that to enjoy County Hunting one does not need a kilowatt and antenna farm. It seems fair to give other mobiles and DX a little preference, considering the difficulties under which they must operate.

The equipment at W0YLN (home QTH) includes a Heathkit SB-400, SB-300 and a pair of 4-400A's in a homebrew linear with a Mosley CL-36 up 70 feet. The mobile rig is a Swan 500C with Hustler Antennas on a pickup truck.

Clyde Stottlemyre, W0YLN.

---

*103 Whittman St., Rochelle Park, N.J. 07662

During 1969 he had over 12,000 contacts from the mobile rig and gave out over 500 counties (the same ones at different times, in a lot of cases). Has worked over 30 countries from the mobile with 7 of these on 75.

On several of his County excursions he has made over 1500 contacts in less than 48 hours. If someone tried to make him work that hard, he'd probably choke them. You lose everything from your voice to your patience when you go that long and hard and most who have never operated mobile, don't realize nor understand this.

On one trip with Skip, WA0WOB, they covered 3600 miles in 5 days (about 75 or 80 counties) and Skip had work to do every day making business calls. They went from Kansas to Oklahoma to Texas to within 80 miles of the Mexican border, then to Louisiana, Tennessee, Arkansas and Missouri. They slept about 4 or 5 hours a night, but had about 4000 contacts. They even went to 15 meters to give Roy, ZL1KG some needed Counties. Two rigs were taken and spare antennas and a Hy-Gain tape doublet with a collapsible 12 foot mast.

Clyde says he could not possibly list *all* the people who helped him complete All Counties, so all he can say is *thanks* to everyone on the Net and to those who have not yet completed All Counties, keep at it because with the gang that operates in the ICHN, you undoubtedly will make it in due time. Clyde says, "See you all in Kansas City, July 4th".

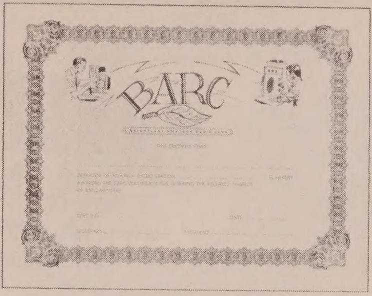
Awards Issued

The month was slow, so in order to tell the complete "Story" on W0YLN and perhaps be able to tell about a couple of extra awards, no list will appear this month.

Awards

BARC Awards: Sponsored by the Brightleaf Amateur Radio Club of Greenville, N.C. Certificate #1 for contacting club members since January 20, 1967 on any band and mode. DX stations (including KH6 and KL7) contact 5 members. W/VE contact 10 members. Club members contact 15. Certificates will be endorsed for each additional 5 members contacted.

Certificate #2 will be issued for contacting, club members since January 20, 1967 on 50 mc or higher. Contact 5 members. Club members must contact 7 other members and 3 others with at least 1 contact outside N.C.


BARC

BARC Award.

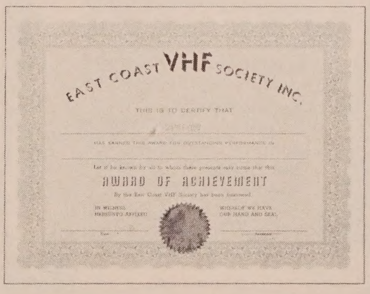
There is no charge for these certificates. QSL's are not required but BARC members must have received applicants QSL.

Send list and full log data (use GMT time and date) to K4SKI, BARC Awards Manager, RD #2, Box 39-A, Greenville, N.C. 27834. Send s.a.s.e. or s.a.e. & IRC for membership list.

East Coast VHF Award: Sponsored by the East Coast VHF Society, Inc., of P.O. Box 1263, Paterson, N.J. 07509. Issued for working the Club Station, WA2WEB plus 4 members or work 5 members on any band 50 MHZ and above. There is no charge. Send GCR list to Custodian, George Kupp, 61 Cortland St., Belleville, N.J. 07109. For membership list, send s.a.s.e.

Kent County Award: The Kent County (Delaware) Amateur Radio Club will send a special certificate (no charge) to amateurs contacting 6 club members, any band. Send confirming cards: Wm. Stallings, WA3HWC, RD #1, Harrington, Delaware 19952 with a s.a.s.e. Membership list for s.a.s.e.

WURK Award: Worked Upsala Radio Klubb with photos of members worked offered to any amateur for working 3

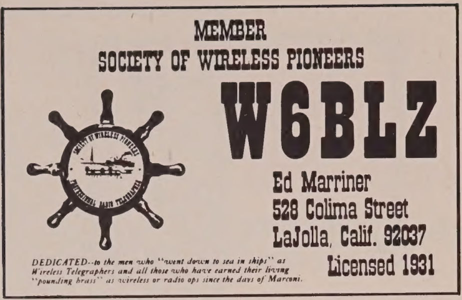

EAST COAST VHF SOCIETY INC.

THIS IS TO CERTIFY THAT

HAS EARNED THIS AWARD FOR OUTSTANDING PERFORMANCE IN

AWARD OF ACHIEVEMENT

East Coast VHF Award.



MEMBER
SOCIETY OF WIRELESS PIONEERS

W6BLZ

Ed Marriner
528 Colima Street
LaJolla, Calif. 92037

Licensed 1931

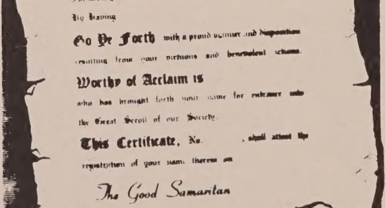
DEDICATED--to the men who "went down to sea in ships" as Wireless Telegraphers and all those who have earned their living "pounding brass" as wireless or radio ops since the days of Marconi.

SOWP QSL.

(Sweden 5) resident members, since January 1, 1962, any band or mode. Send certified list (GCR) with U.S. $1.00 or Sw. Cr. 5 or 10 IRC's to Awards Manager, Box 12006, Upsala, Sweden. Membership includes: SM5, AFE, AFI, AHR, AKC, API, AQG, ASO, AWF, BFC, BFR, BH, BHR, BJT, BLB, BNB, BND, BOE, CDY, CEY, CHB, CHY, CIK, CIP, COM, CON, CQR, CRV, CUI, CUP, CWJ, CXM, DDP, DSF, DSN, DZK, JV, TM, ZY; SL5AB and SL5BO. *(Thanks to W1KVA for this data).*

The Good Samaritan Award: Qualifications for membership and subsequent awards are: 1. For humanitarian service to a fellow amateur, or 2. For service to the public (or a private individual), through amateur radio. 3. For a private individual or organization, for contribution to the amateur radio service.

No one may apply to receive membership. Any person who wishes to nominate an individual, or an amateur (or organization), for membership, must simply write a short note explaining why he feels the nominee is qualified. Send it along with $1.00 to: The Good Samaritan Society, M. L. Krell, Custodian, Box 111, Gibbstown, N.J. 08027.



The Good Samaritan Society
MEMBER

Unto Thee We Grant
Membership Into The Good Samaritan Society
For having evidenced a care for your fellow man-Luke 10:29
By having
Go Ye Forth with a proud manner and disposition
resulting from your virtuous and benevolent scheme.
Worthy of Acclaim is
who has brought forth your name for entrance unto
the Great Scroll of our Society.
This Certificate, No. , shall attest the
registration of your name thereon as
The Good Samaritan

The Good Samaritan Award.

Persons receiving more than one nomination will receive subsequent service awards. Should one be nominated five times, (membership certificate and four service awards), a special Legion of Honor Certificate will be issued.

HK5 Certificate: Issued by the Liga Colombian de Radio-Aficionados for QSO's with HK5 stations after January 1957. Colombian stations must have 20 contacts; other North and South American stations need 12 contacts; and the rest of the world need 8 contacts. All bands, all modes are OK but no cross-band/mode. Send certified log (GCR) to Ana Elisa de Ramirez, HK5AZA, Awards Manager, Liga Colombiana de Radio-Aficionados, Zona 5A, Seccional Cali, Apartado Aereo 6149, Cali, Colombia, South America. There is no charge.

Notes

The Independent County Hunters Convention in Kansas City, July 2, 3, & 4, will be the biggest yet, so if you want to meet all those wonderful people, get your reservations in NOW! Their will be interesting activities, prizes, and out-of-the country guests—including Roy Needham, ZL1KG the first non U.S. station to qualify for all counties! If you have not received all the data, rush an air mail letter and s.a.s.e. to Cleo Mahoney, WA0SHE (See "Story" & fotos, March '71 *CQ*), at 6001 Blue Ridge Cut-Off, Raytown, Missouri 64133.

Gil Baker, W5QPX has a few used POD 26 books for deserving out-of-the-country county hunters, send request to me.

The Society of Wireless Pioneers (SOWP), P.O. Box 530, Santa Rosa, California 95402 has some 800 members, and membership is open to anyone who has ever earned their living as a brasspounder. Their NET meets on 3555 kc each Thursday at 2000 Pacific Time. They will soon publish a directory and early wireless pictures. They hope to soon offer a Certificate for working the required number of members. Thanks to Ed Marriner, W6BLZ for this data. W7IIZ is printing a very distinctive QSL for members, sorry I do not know the cost.

There are sure a lot of new County Hunters active—welcome to the fold. If you have any questions, I'll try to answer them. How was your month? 73, Ed., W2GT.

SURPLUS sidelights

BY GORDON ELIOT WHITE*

THE pell-mell rush into the computer age is definitely providing some interesting fallout for amateurs and experimenters. I picked up in surplus recently a beautiful example of computer technology with a direct application to amateur or s.w.l. RTTY, particularly as transmission speeds are going up. As shown in the photo, this month's goodie is a Kleinschmidt 311 keyboard send-receive printer.

The Kleinschmidt 311 keyboard send-receive printer.

The 311 is a far cry from the rugged olive drab Kleinschmidt teleprinters that have served the U.S. Army for many years. Bearing the Smith-Corona-Marchant label, this set is part of the computer age, yet it can plug along at the old 60 words per minute amateur speed. With simple adjustments the set can be run at 50, 56.9, 75, 150 or 300 Baud, or up to 400 words per minute. No gear changes are involved, just a simple resistance change in a trimmer potentiometer.

Several of the amateur publications have recently printed articles on integrated circuit speed converters for RTTY, along lines I suggested in this column in September, 1969. The 311 is the logical next step, a printer that adjusts internally for different speeds.

In addition to its speed flexibility, the 311, in various forms, offers 5, 6, 7 and 8-level codes, (for example ASCII, the most common computer mode.) The change is made by switching some printed-circuit cards and the printer platen—on which the type font is engraved. Printing is done by solenoids that are driven against the ribbon and paper at the precise point at which the proper character lines up with the print hammer. (fig. 1)

As shown, the "print drum" replaces the usual paper roller or platen in a conventional teleprinter. The drum rotates continuously at high speeds, just behind the paper, which is held in place by rubber rings at each end which turn only on "line feed" command. Positioning of the drum *vis-a-vis* the print hammer at the moment of printing is synchronized by a sensing coil which is energized by the revolving drum itself. These signals are processed in the electronics package to insure correct type alignment.

On some models of the 311, twin print hammers are used, with the internal computer directing first one, then the other, to actually print, thus saving carriage-movement time. In addition, with no letters-figures shift required, the 311 can save that much more time—important when you are printing 40 characters per second.

The keyboard of the 311 consists of six sealed, reed-type switches, actuated by small permanent magnets on code bars which are rotated up or down in accordance with the character selected. Five are information "bits" with the sixth the master, or keying signal. Solid-state electronics circuits process the parallel-output from the switches into serial start-stop, 7.00 unit signals.

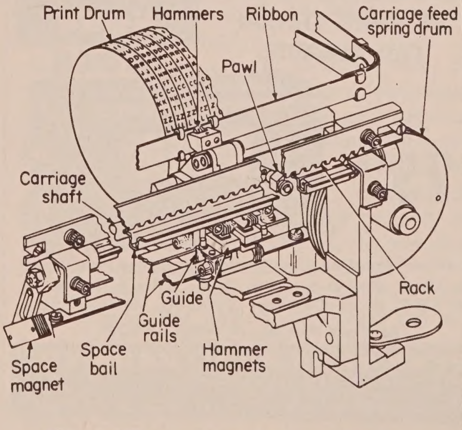


Fig. 1—The carriage feed mechanism.

---

*5716 N. King's Hgwy., Alexandria, Vir. 22303.

WAREHOUSE-SPACE-REDUCTION SALE
(GIVEAWAY PRICES!)

LINE-VOLTAGE REGULATORS:
Sorensen & Superior Elect. Electronic
Types, 0.1% Regulation, 3% Max. Harmonics:

500 VA, 95-130 v in, 110-120 v out	35.00
1000 VA ditto fob Utica, N. Y. or Los Angeles	37.50
2000 VA ditto fob Los Angeles	67.50
2500 VA 0.1% regulation ditto, Los Angeles	99.50
2500 VA 0.1% regulation ditto, Los Angeles	89.50
3000 VA 0.1% ditto brand new, Utica, N. Y.............	99.50
5000 VA 0.1% ditto checked OK, Los Angeles..........	149.50
ditto 190-250 v to 220-240 v, Los Angeles	149.50

Electromechanical, 1%, No Distortion:

6000 VA Super. Electric, Utica or Los Angeles	49.50
ditto General Radio No. 1570AL, Los Angeles	57.50
15 KVA Superior Electric, Los Angeles	195.00
27½ KVA 1 PH. 205-250 v to 220-240, Los Angeles..	195.00
20 KVA 3 Ph. 195-255 v to 220-240, Los Angeles.....	195.00

Miscellaneous Bargains:

General Radio No. 1610A: A complete Capacity-measuring system in a 43" high cabinet, sold for $2090.00. Bridge, Oscil., Null Det., Filter, Guard ckt, etc. Excellent condition, guaranteed	195.00
Sorenson E-28-30: Regular DC Pwr Sply 25-31 v, 0-30 amps, metered ....FOB Los Angeles	59.50
L&N No. 1554-A2: $3200.00 Capacitance & Conductance Bridge Assembly, measures insulation, etc.	195.00
AN/ASM-3: Complete new Test Set for AN/ASQ-8 Magnetometer, with books, FOB San Diego	295.00
Gas Laser: Spectra Physics No. 110 with lens, less the simple power supply. With book	50.00
Nanosec Pulses 32 KV, 3 ma. Details: Ask!	60.00
Hoist Test Set for AN/AQS-10 Sonar	27.50
Hughes No. VTW-29 Stored Energy Welder Pwr.	27.50
Raytheon No. 18A Stored Energy Welder Pwr Sply...	27.50
Stoddart TS-587 (NMA-5) RFI Meter 15-400 MHz, needs repairs, sold as-is, clean, w/book.	97.50
TIC No. 431 Electronic Freq. Changer (or 1000 watt amplifier?) Input 230 v 1 ph 60 Hz. Output adjustable 105-130 v, 330 to 3900 Hz, 1 ph.	195.00
CML No. 33828 3 ph Electronic Freq. Converter, 1500 VA. Input 220 v 3 ph 60 Hz, Output 115 v, 3 ph, 350 to 450 Hz; or use 500 VA any leg with no danger of unbalance, or 1000 VA any leg (3 KVA total) for any 10-second starting load	295.00

If you don't see it here, ask for it! Or ask for the KIND of materials you want, like Oscilloscopes, Counters, VTVM's, etc., etc. Don't ask for a general catalog . . . we believe that is nonsense in surplus . . . we get new things in almost every day! WE ALSO BUY! So tell us what you have, condition, and your asking price.

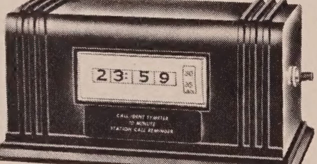
R. E. GOODHEART CO., INC.
Box 1220CQ, Beverly Hills, Calif. 90213
Phone: (213) 272-5707

TYMETER®
"Time At A Glance"
9:37

24 HOUR CLOCK

CALL-IDENT
10-MINUTE STATION
CALL REMINDER

#124
23.50



10-minute repeating timer buzzes warning to sign in your call letters. Walnut or ebony plastic case. 4"H, 7¾"W, 4"D. 110V, 60 cy. One Year Guarantee. Made in U.S.A.

At Your Dealer, or DIRECT FROM

PENNWOOD NUMECHRON CO.
TYMETER ELECTRONICS
7249 FRANKSTOWN AVE. PITTSBURGH, PA. 15208

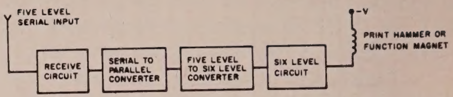


Fig. 2—The overall block diagram of the Model 311.

Timing for the keyboard "clock" is controlled by one or two subminiature tuning forks, of the sort used to run electric wristwatches these days. Four stages of down-counters are provided, with wiring selections allowing the operator to pick off two speeds via a "hi-lo" switch, or others by changing wiring straps on the counter chain.

Generally the keyboard electronics are fairly straightforward, from the parallel switches to a serial converter, and an output amplifier, normally a 2N1302 for a low-level keying output. (this can be followed by a rather heavier transistor such as the DTS-413 for keying a 60 mc loop) The only oddity I note in this section is an electronic keyboard lock, solenoid-operated, which can be ignored in amateur usage. The lock on the panel itself is strictly mechanical.

The printer electronics are far more sophisticated. Fig. 2 is a very simplified block diagram, and space here does not suffice to do more than outline the process. The input is low-level, to a 2N1306 transistor used as a "space detector." The serial signal is converted to parallel form, in the process keying a time base multi-vibrator. The speed signal which the input registers will properly "recognize" is controlled by the time base, which may be varied by adjusting the R-C time constant. Although Kleinschmidt uses a pair of precision trimpots, a calibrated external variable resistor could replace R_{827} as a speed control, permitting the monitoring of any standard—or non-standard—speed from 60 w.p.m. to 300 Baud.

This is only a superficial job on the 311, and it is offered in the same spirit as the 1969 speed-converter column, based on the AN/FGC-5 multiplex set, in the hope of generating interest in practical amateur/experimenter design work.

One thing that might grow out of this might be a refinement of the already-developed speed converter. By running, say, a common Model 28 Teletype printer at 100 w.p.m., and interposing a speed up-converter with such a variable control, any speed, even

LIBERTY PAYS **MORE!**

WILL BUY FOR CASH ALL TYPES

- ELECTRON TUBES
- SEMICONDUCTORS
- Military Electronic Equipment
- Test Equipment

WIRE, WRITE, PHONE COLLECT! WE PAY FREIGHT ON ALL PURCHASES WE MAKE

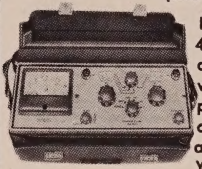
LIBERTY OFFERS **MORE!**

PRESTEL FIELD STRENGTH METER

Larger, loud speaking model. 2.5 microvolt. Only $270.00 F.O.B. New York.

* Never Anything Like It!
* 1-Man Can Do A Better Job Than 3 In The Same Time!
* A Gold-Mine for Antenna Installers!

(Model MC16)



Frequency Range: 40 to 230 and 470 to 860 Megahertz. Calibrated outword from 10 to 50,000 Microvolts. Nothing makes it easier to properly and speedily find the correct place to install TV, FM and Communication Antennas. You can measure and hear the signals with this 4½ volt battery economically powered unit.

Only $120.00 F.O.B., New York

Liberty Electronics, Inc.

548 Broadway, New York, New York 10012, Phone 212-925-6000

from a badly-adjusted transmitting motor, could be copied.

From a communications standpoint of course, the speed adjustments are relatively minor features of the 311. What it represents is a transition device between the purely mechanical teleprinters such as the Model 28, which have been pushed to 150 Baud in the Model 37, which is a much-refined version of the #28—and the truly high-speed equipment such as the IBM line printers, and the 1200 Baud Teletype Inktronic.

The 311 eliminates all reciprocating motion, aside from the carriage return and line feed functions, and allows random character selection without returning a complex printing mechanism to "home" position, as the #28 and #35 sets do. The #37 shifts directly from one character to the next without the time-consuming "home" position, but its complexity appears to be reaching toward the limit of practicality. ■

Q & A [*from page 80*]

If it were tapped at the proper point it would work on 40 meters, but a consideration is that with a mobile antenna using inductive loading, tapping of the coil cannot be readily done without shorting turns which, both according to theory and from our experience, will lower the radiating efficiency over that of a coil with unshorted turns. It will be better to spend a few extra bucks and obtain a coil made specifically for the band of operation, in this case for 40 meters.

Pre-Amp With Transceiver

QUESTION: How can I incorporate an r.f. pre-amp (an Ameco Model PCL) with the HW-100 transceiver?

ANSWER: A pre-amp for receiving may be used with a transceiver in either of two ways. One method is to install the pre-amp between the antenna relay (receive contact) and the antenna input to the receiver r.f. stage. By routing the antenna-receiving circuit with coax cables to phono jacks (for pre-amp in and out) on the rear of the set, the pre-amp may be used as an outboard unit.

The other method is to install the amplifier between the antenna lead and the antenna-input connector with a relay arranged to bypass the pre-amp during transmit. Such a setup is shown in the Q & A Column for March 1969, p. 87.

CASH PAID...... FAST!
For your unused TUBES, Semiconductors, RECEIVERS, VAC, VARIABLES, Test Equipment, ETC. Fair Dealings since 1938. Write or call now! Barry, W2LNI.
BARRY ELECTRONICS, 512 Broadway, New York, N. Y. 10012. (212-WA5-7000) (We buy factory termination & from individuals).

SPACE ELECTRONICS division of MILITARY ELECTRONICS CORP. HAS MOVED AGAIN!
to bigger facilities to handle our large stocks of military surplus electronics. We are always buying and always selling. For all your needs contact us at
76 Brookside Drive • Upper Saddle River
New Jersey 07458 • (201) 327-7640

WE PAY HIGHEST CASH PRICE FOR ELECTRON TUBES & SEMICONDUCTORS
IMMEDIATE PAYMENT ON UNUSED TUBES
H & L ASSOCIATES
ELIZABETHPORT INDUSTRIAL PARK
ELIZABETH, NEW JERSEY 07206
(201) 351-4200

5RK DELTA TRI-BANDER
A Proven DX Antenna
$95
2 element, 10-15-20 meters, delta loop, 30 lbs.
Brochure available. Order direct with check to:
ISLAND ELECTRONICS
4103 Ave. S, Galveston, Texas 77550
Phone: (713) 762-9681

AIM YOUR BEAM FAST, EASILY
Custom computer-produced tables tell exact bearings from your state (or province or DC) to 240 DX prefixes and 60 DX cities on one sheet, and to all states and provinces and 120 US and Canadian cities on another sheet.
Enjoy your beam with modern ease and speed!
$1.25 plus 25c for postage and handling.
ITHACA DATA SERVICE, Dept. C
P. O. Box 215 Ithaca, N. Y. 14850

F.M. MOTOROLA GOVERNMENT SURPLUS

	Used:	Recond.
R-394 Receiver 152-172 MC	$14.95	$22.50
T-278 Transmitter 152-172 MC	18.95	24.95
R-257 Receiver 25-50 MC	19.95	
T-208 Transmitter 25-50 MC	29.95	
CY-938 Cabinet	7.95	9.95
C-847 Control Box	8.95	12.95

Also- Power Supplies, Amplifiers, Modules, etc.
Write: Dept. CQ.
Send For Our BIG CATALOG No. 71
FAIR RADIO SALES
P.O. Box 1105 · LIMA, OHIO · 45802

SX-101A on 20.655 mc

QUESTION: How can I fix up my Hallicrafters SX-101A receiver for operation on 20.655 mc?

ANSWER: The SX-101A may be set up for receiving on 20.655 mc either by adjusting the 21 mc oscillator-inductor core (L_{17}) to lower the oscillator frequency or by adding capacitance across the inductor. The first method will be better if the inductor core will satisfactorily cover the needed range, since better tracking is more likely to be obtained therewith. The core should be moved closer into the inductor winding.

You can keep track of where you're going by setting the dial near 21.0 mc. Turn on the crystal calibrator and b.f.o. and tune in the calibrator at this point. Then adjust the core (inward) until you have passed three 100 kc points and arrive at the fourth one. This should be that at 20.6 mc. Then peak up the signal by adjusting the r.f. and mixer circuits as specified in the manual for 21.0-21.5 mc, except the range of the signal frequencies will now be 20.6 to approximately 21.1 mc. If the r.f. circuits will not tune down to 20.6 or 20.655 mc, add some small capacitance across the 21 mc inductors. This modification, of course, will delete the normal 21.0-21.5 mc range. 73, Bill, W2AEF

Announcements [*from page 12*]

camping, ladies bingo, reserved flea market booths, advance registration. FFor a flyer, contact Morton Silverman, W9GJ, 1121 Bonnie View Drive, Evansville, Indiana 47715.

Chadron, Nebraska

The 17th annual hamfest of the Pine Ridge Amateur Radio Club will be held Sunday, June 6th at the Chadron State Park, nine miles south of Chadron. For further details write to J. Wendell Gorr, WA0PIF, P.O. Box 732, Chadron, Nebraska 69337.

Nashville, Tennessee

The 2nd annual Music City Hamfest will be held in Nashville, Tenn. on June 20th at Edwin Warner Park: Picnic Area #3. There will be prizes, free parking, food available and activities. For complete details write to Theda Givan, K4DIZ, Box 26, Whites Creek, Tenn. 37189.

Englewood, New Jersey

Mayor Ned Feldman of Englewood, New Jersey has proclaimed the week of June 20th through the 26th as Amateur Radio Week in Englewood. Mayor Feldman notes in his proclamation the many services performed by amateurs in the Englewood area for the entire community.

The new 2K-4

THE NEW LOOK OF AN OLD FRIEND

Henry Radio

STILL all the famous 2K-3 features:

- Rugged Construction — Built to last a lifetime.
- Reliable Performance — When you call you QSO.
- Heavy Duty Components — Our power transformer alone weighs more than some amplifiers.
- Conservatively Rated — Loafs at full legal power.
- Floor Console or Desk Model.

PLUS these additional features:

- Modern Styling — Keyed to a new decade.
- Tilted RF Deck for Easier Operation — Looks you right in the eye.
- Mechanically Refined — Pride of ownership is part of the package.
- Brushed Aluminum Panel and — Modern Square Meters (Amplifiers can be beautiful).
- Recessed Power Supply Pedestal.

STILL a superb value at . . . $795.00

If you are one of the more than 3000 happy 2K owners, trade up to the new 2K-4. If you are not one of the group now is the time to join. For full information write:

Henry Radio

11240 W. Olympic Blvd., Los Angeles, Calif. 90064 213/477-6701
931 N. Euclid, Anaheim, Calif. 92801 714/772-9200
Butler, Missouri 64730 816/679-3127

Henry Radio has representatives in different areas of the U.S. to simplify ordering for those living near one. Or you can order direct and we will ship . . . across the street or around the world. Call or write for specifications and terms.

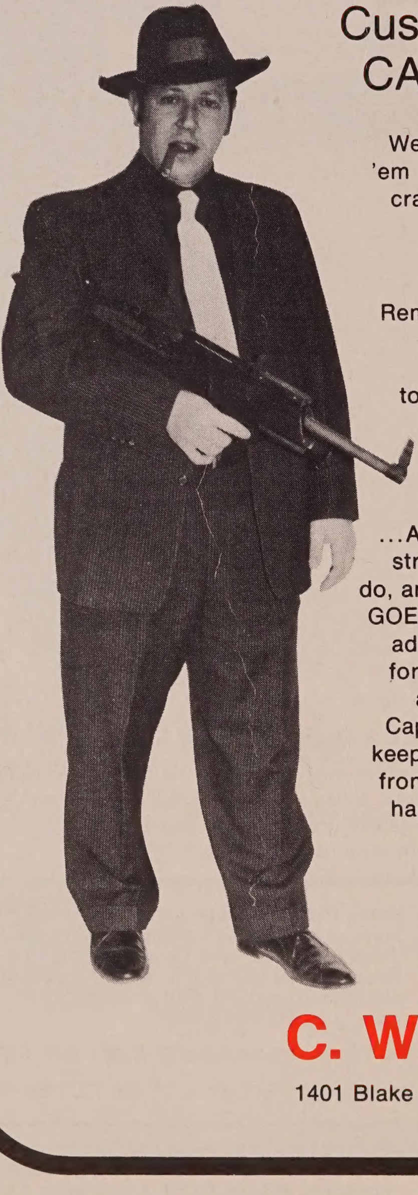
New York area: John Richardt, W2WIY (201) 637-4107
Houston area: Jan Carman W5SBX (713) 464-0419

Attention: Military and commercial users. The 3K amplifier is now available for continuous duty high power RTTY and extra power SSB operation. $895.00 F.O.B. Los Angeles, Calif.

The most powerful antennas under the sun!

WANTED

Customers for CAPONE!



Well, don't just stand out there. Go on in. Tell 'em "John Capone" sent you. J. Capone is our crafty leader—no relation to that OTHER one, maybe shirt-tail brother or a grandson or something. Here, have a chair. (Not the hot seat.) We'll give you the business.

Remember those hot deals you heard about in "Chi." Well, we do our own Capone thing out here in Denver. (Mile-high steals, so to speak.) ...Also. While doing business with the Capone Gang, you will never say you wuz robbed. No. Truth is, you will probably blab around that you held us up. (Please leave your mouthpiece outside.) ...Also. All our loot is Fed-approved. We run a straight place, because John Capone says we do, and whatever John Capone says around here GOES! ...Also. We have a perfectly legit Denver address, so if you don't look us up, we'll look for you—see! You say you would like to make a quick shady deal? Well, that's no deal! At Capone's Place, the "Deals" are to create and keep happy customers. No blackmail or dealing from the bottom—Big Bad John says keep 'em happy, service what we sell, and build a good reputation. Dem's orders!

C. W. ELECTRONICS

1401 Blake Street / Denver, Colorado / (303) 244-5523

REWARD

$$$$$$ in Savings
Come in and cross palms with the Capone Gang!

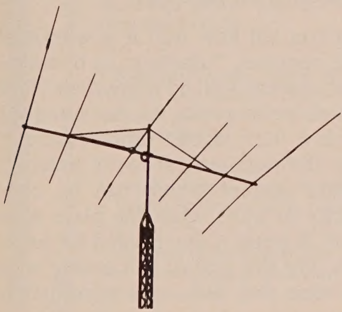
GALAXY
GALAXY GT-550A
GALAXY
GALAXY

Consider the Hy-Gain IMPROVED Galaxy GT-550A with MORE POWER for only $495. Delivers 550 watts of power, the best transceiver on the market for the money, bar none. Operating either fixed station or mobile, the GT-550A is guaranteed to have a top frequency stability after warm-up. We're so proud of the stability, we include a graph with each GT-550A set sold showing the purchaser how stable his radio was when it went through final check under the eagle eye of Hy-Gain's demanding quality control department.

- 500 watts SSB; 360 watts CW
- Sensitivity better than .5 uv for 10db S/M/N
- 45db carrier suppression
- 25 KHz calibrator and vox option
- No frequency jump when you switch sidebands

Order No. 800 Ham Net $495.00

Accessories available for GT-550A to make up a total system.



COMPLETE ANTENNA COVERAGE WITH HY-GAIN'S HAM LINE MODEL TH6DXX

The new 6-element Super Thunderbird TH6DXX offers the ultimate in tribander performance and mechanical reliability for 10, 15 and 20 meters.

- Hy-Q traps, featuring large diameter coils.
- Gain 8.7db (average)
- VSWR 1.5:1.
- Longest element 31′ on 24′ boom.

Order No. 389 Ham Net $179.95

Along with a full range of fixed antennas, Hy-Gain offers mobile antennas for every purpose, including the new Hamcats—widest bandwidth / highest power handling / lowest heat drift ratio.

"Closed on St. Valentine's Day for sentimental reasons."

COME SEE OUR NEW STORE!

Punch clean, true holes in seconds.

A Greenlee chassis punch is the quickest way yet to cut round, square, key, D, or double-D holes in 16-gauge metal, hard rubber, plastics, epoxy, etc. Available at radio and electronics parts dealers. Or write for Catalog E-730 to: Greenlee Tool Co, 1758 Columbia Ave., Rockford, Ill. 61101.

GREENLEE TOOL CO

A UNIT OF
XLO®
EX-CELL-O CORPORATION

SUMMER SALE!

B&W LO PASS FILTER Model 424
was $21.00 NOW ONLY $10.88

BARKER & WILLIAMSON, INC.
Canal Street, Bristol, Pennsylvania 19007

WORLD QSL BUREAU

5200 Panama Ave., Richmond, CA USA 94804

THE ONLY QSL BUREAU to handle all of your QSLs to anywhere; next door, the next state, the next country, the whole world. Just bundle them up (please arrange alphabetically) and send them to us with payment of 4 ¢ each.

INDUSTRIAL & GOVERNMENT ELECTRONIC SURPLUS

FB
PARTS
EQUIPMENT
AMATEUR RADIO
TUBES & SEMICONDUCTORS

MONTHLY CATALOGS
ALL DIFFERENT
GET YOURS
NOW

STAR-TRONICS
P. O. BOX 17127 PORTLAND, OREGON 97217

PLEASE USE YOUR ZIP CODE NUMBER ON ALL CORRESPONDENCE

Contest Calendar [*from page 79*]

Final Score: Total QSO points × the sum of the multiplier.

Awards: There are Trophies and medals for the leading stations in each category.

In addition, certificates will be awarded to each station with the following totals: *Americas:* Working 10 YV's and 10 other countries. *Other continents:* Working 5 YV's and 5 other American countries. S.w.l.'s must report 50 stations in the contest for a certificate. A remittance of $1.00 or its equivalent in IRC's is requested for each application.

Entries must be postmarked no later than August 1st and they go to: Radio Club Venezolano, Indenendence Contest, P.O. Box 2285, Caracas, Venezuela.

Editor's Notes

I find it increasingly more difficult to meet the deadline each month because announcements and other material from the many organizations is just not getting to me in time.

As I have stated time and time again you must allow a minimum of three months before the date of the event. This will make the issue prior to the month in which the activity takes place. Foreign contests should allow even more time so that the announcement will appear in an earlier issue for the benefit of overseas readers.

Hope you fellows have carefully studied the proposed frequency changes by the FCC and voiced your comments. The proposed changes in the 40 meter band should clear up the present confusion regarding inter-regional contacts and be of special benefit to contest operation.

I personally approve the whole package but think the Generals could have been given a little more elbow room.

73 for now, Frank, W1WY

Power Meters [*from page 31*]

How can you tell how well it is working?

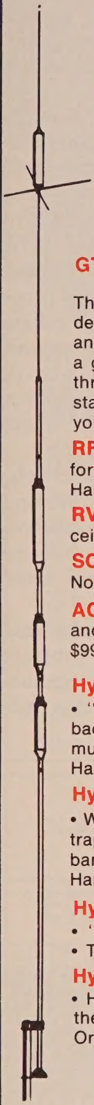
The FCC requires, "amateur s.s.b. transmitters must operate with no more than 1000 watts input on voice peaks, as measured on a meter with a 0.25 second time-constant." This creates the requirement for a meter to measure plate current which can be converted directly to watts when the plate voltage is known. A meter is also needed for tune-up purposes, but the goal of this article is to convey the idea that little real information can be obtained from looking at the plate or r.f. current meter—and you really should *not watch it!*

If your transmitter employs a.l.c., and it is metered, by setting the microphone gain control at a level that causes an a.l.c. indica-

The most powerful signals under the sun!

THE GALAXY 550A

MORE POWER, MORE FLEXIBILITY FOR THE Fixed Station...



GT-550A Transceiver Order No. 800 Ham Net $550.00

The GT-550A is the best transceiver on the market for the money. Bar none. Costs just $550 and delivers 550 watts of power. Operating either fixed station or mobile, this transceiver is guaranteed to have a top frequency stability after warm-up. We're so proud of the stability we include a graph with each GT-550A showing the purchaser how stable his radio was when it went through final check. 550 watts SSB; 360 watts CW; sensitivity better than .5 uv for 10db S+N/N; stable—45db carrier suppression; 25 KHz calibrator and vox option; no frequency jump when you switch sidebands.

RF550 contains high accuracy watt meter; calibrated in 400 and 4,000 watt scales; switch for forward or selected power; switch to select 5 antennas or dummy load. Order No. 805 Ham Net $75.00

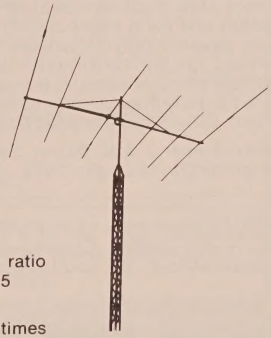
RV550 is a solid state VFO. Function switch selects the remote unit to control Receive-Transceive-Transmit frequency independently. Order No. 804 Ham Net $95.00

SC550 Speaker Console with headphone jack. AC400 power supply will mount inside. Order No. 803 Ham Net $29.95

AC400 Power Supply is heavy duty solid state to operate GT-550A at full power, on SSB or CW, and with switch selection of 115/230 VAC, 50/60 Hz input voltages. Order No. 801 Ham Net $99.95.

Hy-Gain's *Super Thunderbird* TH6DXX

• "Hy-Q" Traps • Up to 9.5db forward gain • 25db front-to-back ratio • SWR less than 1.5:1 on all bands • Takes maximum legal power • 24-foot boom. Order No. 389 Ham Net $179.95



Hy-Gain's 18 AVT/WB

• Wide band performance, 80 through 10 meters • Three Hy-Q traps • Top loading coil • True 1/4 wave resonance on all bands • SWR of 2:1 or less at band edges. Order No. 386 Ham Net $59.95

Hy-Gain's Thunderbird TH3Mk3 (not shown)

• "Hy-Q" traps • Up to 8db forward gain • 25 front-to-back ratio • Takes maximum legal power. Order No. 388 Ham Net $144.95

Hy-Gain's 400 Rotator/Indicator

• Handles large beams and stacked arrays with ease—up to 10 times the mechanical and braking capability of any rotator on the market. Order No. 400 Ham Net $189.95

Call Don or Bob

MADISON ELECTRONICS SUPPLY

1508 McKinney (713)-224-2668 Houston, Tex. 77002

NEED CRYSTALS?

We can supply crystals from 2KHz to 80MHz in many types of holders.

SPECIALS
Color TV crystal (3579, 545KHZ) wire leads $1.60
4 for $5.00
100KHz freq. std. crystal (HC13/U) $4.50
1000KHz freq. std. crystal (HC6/U) $4.50
Any CB crystal TR. or REC. except synthesizer crystals $2.50
Any amateur band crystal in FT-243 holder (except 80 & 160m.) $1.50 or 4 for $5.00
80 meter FT-243 holders $2.50

We have in stock over six million crystals which include types CR1A/AR, FT243, FT241, MC7, HC6/U, HC13/U, HC25/U, HC18/U, etc. Send 10¢ for our 1970 catalog with oscillator circuits, listing thousands of frequencies in stock for immediate delivery. (Add 10¢ per crystal to above prices for shipment 1st class mail, 15¢ each for air mail).

JAN CRYSTALS

Special Quantity Prices to Jobbers and Dealers

ORDER DIRECT
with check or money order to
JAN
CRYSTALS
2400A Crystal Drive
Fort Myers, Florida 33901

ATTENTION
HW-100, -101 owners
SB-100, -101-102 owners

Add 25, 50 & 75 kHz calibration to your rig at low cost. New plug-in conversion allows you to spot sub-bands and band edges quickly, accurately. Built-in power supply eliminates troublesome batteries . . . plug-in construction means no extra cables, wiring or external boxes. Factory assembled & tested; unconditionally guaranteed for 1 year. Only $11.95 postpaid. Order now.

benton harbor r & d, 460 w. napier avenue, benton harbor, michigan 49022.

10 AMP.
FILAMENT CHOKE KIT
$2.00
Pack & Post: 50 ¢
COMPLETE INSTRUCTIONS FREE ILLUSTRATED FLYER
AMIDON Associates
12033 OTSEGO STREET
NORTH HOLLYWOOD, CALIF 91607
12X100 MM ROD $1.25

tion somewhere near that stated as desirable in the instruction book, your transmitter *is* operating up to its rated power and is *not* being driven into non-linearity, and this is all the information you need. If you own an oscilloscope, this statement can be proved, because you can observe that the voice peaks do rise as high as the full c.w. output, regardless of meter readings, when monitoring the r.f. signal going to the antenna. The oscilloscope reports accurately because it has no needle movement which has mass (which has inertia) or damping factor, but responds instantly.

Another factor also must be considered. We have assumed the linear amplifier is operated class AB_1. This is almost universal in presently offered exciters and transceivers, but linear amplification can be obtained from tubes biased from class A to full class B. With class A operation, the plate current remains completely steady whether a signal is present or not and with full class B the stage is biased to cutoff with no plate current flowing unless drive is present. Classes A_1, AB_1, and AB_2 give increasingly greater changes in plate current, so the exact manner in which the tubes are biased cannot be ignored.

A discussion of peak power, peak envelope power, average power, indicated power under key-down, two-tone, multiple-tone and voice conditions also is pertinent but has been covered in many books and magazine articles previously.

Joe's transmitter down the block might give higher meter readings than yours, but both transmitters probably are operating correctly—under the conditions that affect them. ■

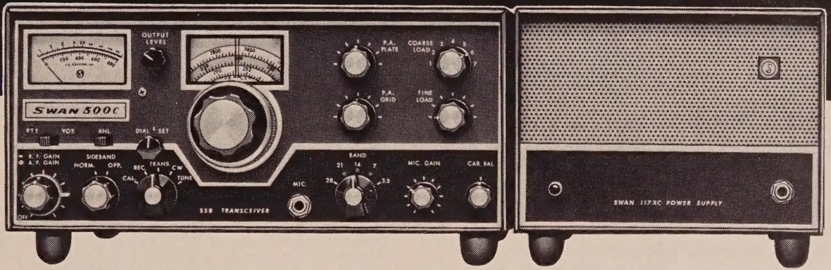
PLEASE USE YOUR ZIP CODE NUMBER ON ALL CORRESPONDENCE

Propagation [*from page 77*]

Brazil, Argentina, Chile & Uruguay	08-12 (1) 12-15 (2) 15-18 (3) 18-19 (2) 19-20 (1)	06-07 (1) 07-09 (2) 09-13 (1) 13-15 (2) 15-16 (3) 16-19 (4) 19-20 (3) 20-22 (2) 22-00 (1)	13-15 (1) 15-17 (2) 17-18 (3) 18-22 (4) 22-00 (3) 00-02 (2) 02-04 (1) 04-06 (2) 06-09 (1)	21-22 (1) 22-01 (2) 01-04 (1) 23-03 (1)*
McMurdo Sound Antarctica	*Nil*	13-15 (1) 15-18 (2) 18-20 (1)	13-16 (1) 16-18 (2) 18-23 (3) 23-02 (2) 02-06 (1) 06-08 (2) 08-09 (1)	22-03 (1)

JUGE

YOUR SWAN HEADQUARTERS IN THE SOUTH...WITH FACTORY DIRECT PRICES!



on all in-stock items...

MAIL ORDERS SHIPPED IN 24 HOURS

SWAN PRICES • CASH WITH ORDER • NO TRADES

500CX — STANDARD FILTER	$449	500CX — SS16 FILTER	$509
117XC — AC SUPPLY/SPEAKER	95	14-117 AC/DC SUPPLY	118
508 — EXTERNAL VFO	129	510X — CRYSTAL OSCILLATOR	44
VX II — VOX UNIT	29	FP-1 — PHONE PATCH	39
270-B DELUXE CYGNET	399	1200W — LINEAR AMP.	189
250C — 6 MTR TRANSCEIVER	399	TV-2B — 2 MTR. TRANSVERTER	289

SWAN'S *BIG* LINEARS

MARK II ... CONSERVATIVE 2000W PEP ... COMPLETE	$499
MARK 6B ... SAME 2000W PEP FOR 6 METERS ... COMPLETE	$499

NEW FROM SWAN

FM-2X ... 12 CHANNEL DELUXE 2-MTR FM AC/DC (comes with crystals for "94/94" & "34/94")	$229

ENTIRE SWAN LINE IN STOCK NOW!

TRADE-INS ACCEPTED AT SOMEWHAT HIGHER PRICES.

ED JUGE ELECTRONICS, INC.

PHONE:
(817) 926-5221

3850 SOUTH FREEWAY
FORT WORTH, TEXAS 76110

Proved in Commercial 2-way
Now Available To Amateurs!

Larsen Mobile Gain Antenna 144-148 MHz

The result of over 25 years of two-way radio experience. Gives you . . .

- **3 db + gain over 1/4 wave whip**
- **6 db + gain for complete system communications**
- **V.S.W.R. less than 1.3 to 1**
- **Low, low silhouette for better appearance**

The fastest growing antenna in the commercial 2-way field is now available to Amateurs. It's the antenna that lets you HEAR THE DIFFERENCE. Easily and quickly adjusted to any frequency. Hi-impact epoxy base construction for rugged long life. Silver plated whip radiates better. Handles full 100 watts continuous. Models to fit any standard mount. Available as antenna only or complete with all hardware and coax.

Get the full facts on this amazing antenna that brings signals up out of the noise . . . provides better fringe area talk power. Write today for fact sheet and prices.

Sold with a full money back guarantee. You hear better or it costs nothing!

also available . . .
5 db Gain Antenna for 440-450 MHz

Phased Collinear with same rugged construction as Larsen 2 meter antennas and 5 db gain over reference 1/4 wave whip. Models to fit all mounts. Comes with instructions. Write today for full fact sheet and price.

Larsen Antennas
11611 N.E. 50th Ave. ■ Vancouver, WA. 98665
Phone 206/695-5383

Time Zone: PST (24-Hour Time)

WESTERN USA TO:

	10 Meters	*15 Meters*	*20 Meters*	*40/80 Meters*
Western Europe & North Africa	*Nil*	07-08 (1) 08-10 (2) 10-14 (1) 14-16 (2) 16-17 (1) 20-22 (1)	23-05 (1) 05-07 (2) 07-14 (1) 14-16 (2) 16-21 (3) 21-23 (2)	19-22 (1)
Central & Northern Europe & European USSR	*Nil*	06-08 (1) 13-16 (1) 20-22 (1)	13-15 (1) 15-20 (2) 20-22 (3) 22-00 (2) 00-07 (1)	19-21 (1)
Eastern Mediterranean & Middle East	*Nil*	07-09 (1) 09-11 (2) 11-14 (1) 19-21 (1)	12-15 (1) 15-19 (2) 19-21 (3) 21-23 (2) 23-00 (1) 05-07 (1)	*Nil*
West & Central Africa	07-10 (1)	06-10 (1) 10-12 (2) 12-16 (1) 16-18 (2) 18-19 (1)	12-14 (1) 14-17 (2) 17-19 (3) 19-21 (4) 21-23 (3) 23-03 (2) 03-07 (1)	20-23 (1)
East Africa	*Nil*	08-12 (1) 12-15 (2) 15-16 (1) 19-21 (1)	14-16 (1) 16-18 (2) 18-21 (3) 21-23 (2) 23-00 (1)	*Nil*
South Africa	*Nil*	07-09 (1) 09-11 (2) 11-12 (1) 22-00 (1)	14-16 (1) 21-22 (1) 22-00 (2) 00-06 (1) 06-08 (2) 08-10 (1)	19-22 (1)
Central & South Asia	*Nil*	07-09 (1) 09-11 (2) 11-13 (1) 17-19 (1) 19-21 (2) 21-22 (1)	22-04 (1) 04-08 (2) 08-11 (1)	*Nil*
Southeast Asia	*Nil*	07-08 (1) 08-10 (2) 10-12 (1) 16-19 (1) 19-21 (2) 21-22 (1)	22-00 (1) 00-02 (2) 02-04 (3) 04-06 (2) 06-98 (3) 08-10 (2) 10-13 (1)	02-06 (1)
Far East	13-15 (1)	08-09 (1) 09-11 (2) 11-13 (1) 13-14 (2) 14-16 (3) 16-18 (2) 18-21 (1)	18-20 (1) 20-22 (2) 22-00 (3) 00-02 (4) 02-03 (3) 03-06 (2) 06-09 (3) 09-11 (2) 11-14 (1)	01-02 (1) 02-05 (2) 05-06 (1) 02-04 (1)*
South Pacific & New Zealand	11-13 (1) 13-18 (2) 18-19 (1)	08-10 (1) 10-11 (2) 11-13 (3) 13-15 (2) 15-17 (3) 17-19 (4) 19-20 (3) 20-21 (2) 21-22 (1)	16-18 (1) 18-20 (2) 20-01 (4) 01-05 (2) 05-07 (4) 07-10 (2) 10-12 (1)	21-22 (1) 22-00 (2) 00-05 (3) 05-06 (2) 06-07 (1) 23-01 (1)* 01-04 (2)* 04-06 (1)*
Australasia	13-16 (1) 16-19 (2) 19-21 (1)	06-08 (1) 12-14 (1) 14-17 (2) 17-19 (3) 19-21 (4) 21-22 (3) 22-00 (2) 00-02 (1)	19-21 (1) 21-23 (2) 23-04 (4) 04-06 (3) 06-08 (4) 08-09 (2) 09-12 (1)	23-01 (1) 01-03 (2) 03-05 (3) 05-06 (2) 06-07 (1) 01-06 (1)*

[*Continued on page 98*]

ELECTRONICS' LATEST
TROUBLE-SHOOTER

A compact—complete—
circuit analyzer
The SERVISET

Model EC
Patented

INTRODUCTORY
PRICE
$29.95
POSTPAID

A precision engineered professional quality electronic test instrument. Ideal for field or bench servicing of all types of Communications gear.

CHECKS: sync, sweep, video, audio circuits, high voltage supplies (DC, RF or Pulse), low voltage supplies, coils, capacitors, resistors, tubes, transistors, diodes, transformers, speakers, etc. Will locate trouble to a particular stage, determine defective component and can actually be clamped in circuit to restore circuit operation temporarily in 80% of component or tube defects. Ideal for locating and confirming intermittents.

SPECIFICATIONS:

RF & AF Signal Tracer, RF & AF Signal Injector, AC & DC Voltage Indicator 0/60/550/20,000 DC Polarity Indicator 60/550/20,000 volts. Lo ohms 0-5. Hi ohms 0-500k-20 megohms. Tests Condensers, .00025-12 mfd., Tests Resistors 2 ohms-20 megohms, 2 Capacitance Sub ranges .01-.1 & 4-40 mfd., 3 Resistance Sub ranges 50-500 ohms, 5k-25k, 100k-1 meg.

30 Day Money-Back Guarantee

LEL
LEE ELECTRONIC LABS., CO.
88 Evans Street
Watertown, Massachusetts 02172
WA1HXZ

FREQUENCY STANDARD

Gnd
Out
100
50
25
10
5
OFF
Zero
FREQUENCY STANDARD
PALOMAR ENGINEERS

Only
$32.50
(less batteries)
POSTPAID USA

- *Precision crystal*
- *Fully guaranteed*
- *Markers at 100, 50, 25, 10 or 5 kHz selected by front panel switch.*
- *Zero adjust sets to WWV. Exclusive circuit suppresses unwanted markers.*
- *Compact rugged design. Attractive, completely self contained.*
- *Send for free brochure.*

**PALOMAR
ENGINEERS**
BOX 455, ESCONDIDO, CA 92025

Hey!
Hams, Engineers, Hobbyists
MARK LIKE

MAGIC

Any surface can be marked with **DATAK'S DRY TRANSFER** titles and symbols. The results are professional, it looks like the finest printing!

Write for your FREE SAMPLE and Catalog, listing hundreds of letter sheets and symbol sets.

Order from your distributor or directly from:

* From #K-64 ¼" letters and numerals . . . **$1.50**
Also available #9581 professional title set for electronic equipment . . . **$5.95**

THE DATAK CORPORATION
85 Highland Ave. / Passaic, New Jersey 07055

A Colossal DX Contest!

GRAND PRIZE: Name your favorite country and EI will fly you there via Pan American World Airways, World's Most Experienced Airline.

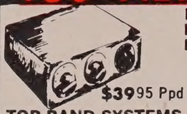
Plus many other valuable prizes, including an RCA $2,000 color TV, a Heathkit/Thomas Theater Organ kit, Heathkit modular color TV kits and Conar portable color TV kits.

ELECTRONICS
ILLUSTRATED

50¢ at newsstands everywhere

Now 50% off on a trial subscription! For 12 issues send only $3 to: Electronics Illustrated Subscription Dept., Fawcett Place, Greenwich, Conn. 06830. Include name and address and state whether new or renewal.

160 METER ANTENNA

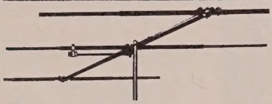


MODEL 48MV MATCHVERTER WILL RESONATE ANY 40 OR 80 METER DIPOLE/INVERTED VEE ON 160 METERS

- Handles 250W PEP (140W DC)
- Use coax or open feedline
- Use with any SWR bridge
- Made in USA—Guaranteed

$39^{95} Ppd

TOP BAND SYSTEMS
5349 Abbeyfield, Dept. 1, Long Beach, Calif. 90815



HILLTOPPERS
FOR SIX AND TWO
3L 6M $14.95
8L 2M $16.95
Full Size Open. Fit Any Car Trunk Closed; Also Saturn Six Halos. 6&2 Lunenburg Beams
HI-PAR PROD., BOX 88, FITCH, MASS. 01420

ELECTRONIC FIST . . THE PROFESSIONAL KEYER

Check the Reviews . . . . . .

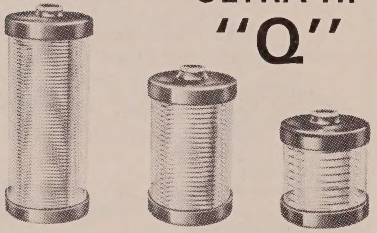
- QST, March 1971
- POP. ELECT., July 1970
- CQ, January 1971
- 73, January 1971
- Ham Radio, August 1970, December 1970, March 1971

* IC MEMORY FOR EK-39M now only $39.95!!

CURTIS ELECTRO DEVICES
From your ham dealer or direct.
Box 4090, Mountain View, California – 94040

Master Mobile

COILS GIVE YOU ULTRA-HI "Q"



FOR 80 - 40 - 20 & 15 METERS

You get coil performance for any band based on years of testing and proof in use. Power ratings of 500 and 1000 watts A.M. Use with 36" base section, 60" whip. 2¾" diam. Low as $7.25.

ORDER TODAY FROM

Master Mobile Mounts
Div. of CRYSTEK
1000 Crystal Drive, Fort Myers, Florida 33902

PLEASE USE YOUR ZIP CODE NUMBER ON ALL CORRESPONDENCE

Northern & Central South America	08-10 (1) 10-12 (2) 12-14 (1) 14-16 (2) 16-17 (1)	07-08 (1) 08-12 (2) 12-14 (3) 14-17 (4) 17-18 (3) 18-19 (2) 19-20 (1)	08-10 (2) 10-13 (1) 13-15 (2) 15-17 (3) 17-22 (4) 22-00 (3) 00-05 (2) 05-08 (3)	20-22 (1) 22-03 (2) 02-05 (1) 22-03 (1)*
Brazil, Argentina, Chile & Uruguay	08-12 (1) 12-14 (2) 14-16 (3) 16-18 (2) 18-20 (1)	05-06 (1) 06-08 (2) 08-12 (1) 12-14 (2) 14-16 (3) 16-19 (4) 19-20 (3) 20-21 (2) 21-22 (1)	13-15 (1) 15-17 (2) 17-18 (3) 18-22 (4) 22-00 (3) 00-02 (2) 02-04 (1) 04-06 (2) 06-09 (1)	21-23 (1) 23-01 (2) 01-03 (1) 23-02 (1)*
McMurdo Sound, Antarctica	*Nil*	14-16 (1) 16-20 (2) 20-21 (1)	15-17 (1) 17-18 (2) 18-00 (3) 00-03 (2) 03-06 (1)	21-04 (1)

R/C Cars [*from page 26*]

latter operates by *pulse* proportional[1] and the system also allows on-off motor control. It is made by Testor R/C Corporation, and the complete car and radio system cost around $80 from such outlets as Lafayette Radio Electronics. The car is to approximately 1/11th scale, is about 15" long. The 1/8th scale cars discussed earlier run around 18-22" long, are much heavier. It is really quite a ball to race several of these little cars together!

How does one get more information on model car racing? As with model planes and other hobby fields, the best ways are to join a group that specializes in the field, visit an area where the models are in operation so you can watch the techniques and talk to the drivers, read the periodicals and books available on the subject. ROAR publishes a monthly newsletter that keeps its members current on all happenings in the field. ■

---

[1] See July-Aug. 1970 *CQ*, page 42.

Satellite News [*from page 42*]

worked or heard through the AO-B repeater should be sent to AMSAT for technical evaluation (c/o P.O. Box 27, Washington, D.C. 20044). AMSAT would also like to receive signal reports of the repeater's beacon transmissions on 29.45 mc. Logs should also contain a brief description of the equipment used, including where possible, an estimate of the e.r.p. used in the direction of the repeater. A distinctive World Telecommunication Day commemorative QSL card will be sent by AMSAT for each log received. Naturally, QSL's verifying two-way contact through the repeater should be exchanged directly between the stations involved.

AMSAT calls this first flyover AMSAT AIRCRAFT-1 (AA-1). Aside from marking World Telecommunication Day the flight is intended to check out the repeater, familiarize radio amateurs with the repeater's operational capabilities and limitations, provide procedural practice, and test operator discipline, especially concerning the requirement to reduce power levels to avoid repeater capture. Additional flight-testing of this and the other repeaters are planned during the next several months. Any radio amateur who may be able to make an aircraft available for these flyovers, especially in the southern and western areas of the country should notify AMSAT as soon as possible.

For later details concerning the May 15-16 flyover, check W1AW bulletins or write directly to AMSAT at P.O. Box 27, Washington, D.C. 20044. ■

SWR Bridge *[from page 68]*

means that the bridge is balanced. After the antenna is tuned up to satisfaction, the bridge can be turned off by turning S_1 to the blank position and removed. The regular transmission line is then ready to be connected to the antenna.

Additional Uses

Although the bridge is intended for use as an antenna tune-up device, I have also found it most helpful as a signal source for calibrating and peaking up the receiver. It can be used any time a low level signal source is needed and output is still taken from J_2.

Conclusions

The bridge device described here will not solve all of your antenna tune-up problems, but will at least make the job less frustrating. The XYL should also now be free to do less important things than adjust the transmitter output power while you shoot for a full scale meter reading a hundred feet away. ■

Ham-M Rotator *[from page 46]*

box and the rotator. In some cases, the r.f. in the control box was sufficient to burn out the 1/2-ampere fuse, even though power was not applied to the control box. This problem was very easily cured by adding another .01 mf ceramic capacitor from the side of the 1/8-ampere fuse feeding the meter circuit to the metal front panel. The addition of this capacitor is shown as C_{502}.

The last remaining meter fluctuation was cured by adding another .01 mf capacitor from the output side of the original diode to ground. This is shown as C_{503}.

All of the above capacitors should be installed with leads as short as possible. In all instances, ground consists of the inside metal panel. The ground side of each capacitor may easily be soldered to the cadmium plated metalwork in the immediate vicinity of the circuit being bypassed for r.f.

After making the above changes in several Ham-M control boxes, completely satisfactory results have been obtained in a rather complex station employing several rotators and beams—on 10, 15, and 20 meters, as well as fixed wire antennas for the 40, 80, and 160-meter bands, together with upwards of six transceivers in a station modestly well equipped for contest operating. ■

How To Speak It *[from page 63]*

ing a transistorized power supply. The term is now used by many amateur f.m.'ers to describe any piece of equipment using a transistorized power supply.

Twenty db quieting: This is a measurement of the sensitivity of an f.m. receiver. The 20 db quieting point is determined by placing an a.c. voltmeter across the speaker of the receiver. The volume is adjusted for a relative reading on the meter (e.g., 1.0 volts). The signal is then applied through a calibrated attenuator until the meter reads 0.1 times the original value (e.g., 0.10 volts). The level in microvolts required to reach this reading is the 20 db quieting sensitivity. Specifications for low band equipment is usually in the neighborhood of 0.35 microvolts, for high-band equipment 0.50 microvolts, and for u.h.f. equipment, 0.7 microvolts to obtain the 20 db quieting point.

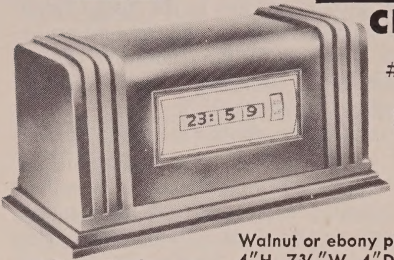
Twin-V: This is a registered trademark of Motorola used to describe its line of tube-type vibrator power supply equipment which can operate on 6 or 12 v.d.c.

Voice Commander: The Voice Commander is a line of portable equipment manufactured by General Electric. The receivers were usually fully transistorized and the transmitters ranged from tube-type (using sub-miniature quick heating filament tubes) to fully transistorized in later models. These units were relatively wide and flat. They used slide switches for major control functions excepting Push-to-talk. Some models are equipped with Nicad batteries.

Warp: This is the practice of tuning either a variable capacitor or inductor in the crystal oscillator circuit of either the transmitter to pull the crystal to the correct frequency. The technique is called "rubbering" by many f.m.'ers.

Whistle-on: This is a type of tone-burst system wherein a shrill whistle into the microphone can activate the repeater receiver. The audio network in the decoder must be fairly wide in frequency response to insure proper operation.

[continued on page 102]



TYMETER® **24 HOUR CLOCK**

"Time At A Glance"

9:37

#100-24H

$16

Made in U.S.A.

Walnut or ebony plastic case. 4"H, 7¾"W, 4"D., 110V 60 cy. Guaranteed One Year.

At Your Dealer, or DIRECT FROM

PENNWOOD NUMECHRON CO.
TYMETER ELECTRONICS
7249 FRANKSTOWN AVE. PITTSBURGH, PA. 15208

HAL DEVICES

MAINLINE RTTY EQUIPMENT

HAL offers complete parts kits for the Mainline ST-6 TU and other RTTY equipment. Get both the circuit boards and parts from one source and save. Please write for full details and prices.

HAL DEVICES Box 365 Urbana, Il 61801

2 METER FM

Standard's SR-C826M Transceiver

- *12 Channels (4 supplied)*
- *10 watt power output*
- *Hot MOSFET receiver front end*
- *Low drain—all silicon semiconductors*
- *Full 6 month warranty*

Complete, ready-to-go! Connect power and antenna and you're on the air! **Only $339.95**

NEW! 25W. 851SH ....only **$449.95**
3W./6 channel 811SH **199.95**

Send QSL or circle number for detailed brochure

ERICKSON COMMUNICATIONS
4657 North Ravenswood Avenue
Chicago, Ill. 60640 (312) 334-3200
a division of Carl E. Erickson Co.

F.M. [*from page 38*]

(*e.g.* 146.340 mc) and have overlapping coverage. The selection of a specific tone allows the operator to choose the repeater he wants to use.

News

A quick run-down of some of the various repeaters in use around the country: Morgan City, La. .34/.94; Alexandria, La. .34/.94; Lake Charles, La. .34/.94; Monroe, La. 52.827/52.525; Rome, Ga. .34/.94 (1800 c.p.s. tone burst because of Atlanta and Chattanooga); Mobile, Alabama, .34/.94; Birmingham, Ala. .34/.94; Dallas-Ft. Worth .16/.76, .22/.82, .28/.88, .34/.94 (among others!); Houston, Tex. .28/.88; Pasadena, Tex. .34/.94; San Antonio, Tex. .34/.94; Tyler, Tex. .34/.94; Austin, Tex. .34/.94; Oklahoma City and Tulsa on .34/.94. These are just a few of the many repeaters operating in the United States. How about hearing from all those I haven't heard from yet.

Vacation time is at hand, so there will be many transient mobiles using your repeater. Treat these operators kindly, for some day you may be using their repeater.

That's all for this month. Keep up the good work and keep those cards and letters coming in. ■

DX [*from page 74*]

ATP, HB9NL, PA0PN, 9Y4NN, PY1MFG, W4BRB/VP7, OA8V, and OK2BOB. During the week prior to the contest the call K9CQV/HK0 was used for 99 QSO's on 160, while the calls K8HKB/HK0 and W0KUS/HK0 were used on 80-10 meters. The QSL Manager for all three calls is W8GDQ.

The very rare HG9 and HG0 prefixes have been activated by HG9KPD, 28029 kc at 1600 GMT and HG0KHV, 28035 kc at 1500 GMT. Better get these while 10 is still open. Other rare prefixes reported on 28 mc include ON6VR, 28053 at 1600 GMT, CE8AA, 28049 at 1400, CP6FG, 28016 at 1300, DK6GN, 28021 at 1600, GI4RY (one of only two GI4's in existence) 28035 at 1600, and TF3YL, 28048 at 1500 GMT. *(Tnx WA2HZR).*

WA2HZR also advises that its easy to check for 10 meter propagation to Europe by listening for the GB2SM marker beacon on 28.185 mc. A transmission is made by GB2SM every 5 minutes. If you can't hear them propagation to Europe on 10 will probably be nil.

Outstanding DXers

This is a new series of articles which we plan to use from time to time possibly as an alternate to our amateur radio in other coun-

DRAKE SPR-4

Solid-State–Programable COMMUNICATIONS RECEIVER

The SPR-4 outperforms the best tube receiver, and has all advantages of solid state design . . . low power consumption, high stability and reliability.

Model SPR-4 Amateur Net **$499.95**

PROGRAMABLE for any interest . . . SWL, Ham, lab, BC, marine, etc. • **Only FETs** in signal path • **Linear VFO** with 1 kHz readout • **Covers 150-500 kHz plus any 23 ranges (500 kHz wide) .500-30 MHz • 10 ranges furnished,** others $5.00 each • **Coverage easily changed • 3 band-widths:** 0.4, 2.4 and 4.8 kHz for CW, SSB and AM • **Built-in spkr • Notch filter • 115 or 220 VAC, or 12 VDC • Dimens:** 10¾″ W x 5½″ H x 12¼″ D, **Wt.** 14 lbs.

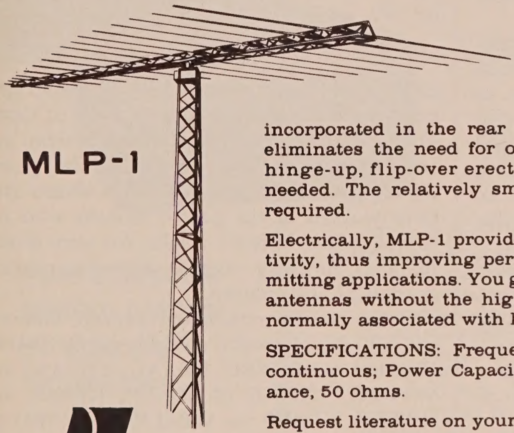
ACCESSORIES: Noise Blanker, 100 kHz Calibrator, MS-4 Speaker, AL-4 Loop Antenna for .15-1.5 MHz, Transceive Adaptor (T-4XB), DC Power Cord, Crystals.

Available at your local distributor.

R. L. DRAKE COMPANY

540 Richard Street
Miamisburg, Ohio 45342

NOW A REDUCED SIZE ROTATABLE LOG PERIODIC ANTENNA FOR COMMERCIAL & MILITARY COMMUNICATIONS



MLP-1

LUNAR INDUSTRIES has developed a reduced size log periodic antenna array that provides outstanding frequency coverage for its size. The antenna is a planar array of dipole elements, with shortening devices incorporated in the rear elements. Structural design of boom eliminates the need for overhead bracing and permits simple hinge-up, flip-over erection. Thus, a crane or gin pole is not needed. The relatively small size allows roof-top mounting, if required.

Electrically, MLP-1 provides significant forward gain and directivity, thus improving performance in both receiving and transmitting applications. You get the advantages of large log periodic antennas without the high cost and excessive size and weight normally associated with log periodics.

SPECIFICATIONS: Frequency Coverage, 6.2 through 30 MHz continuous; Power Capacity, 1 Kw average, 2 Kw peak; Impedance, 50 ohms.

Request literature on your company letterhead.

LUNAR

LUNAR INDUSTRIES, INC.

1855 HIGHWAY 6 WAVERLY, NEBRASKA 68462
TELEPHONE 402/786-2575

How To Speak It [*from page 99*]

Wide-band: The use of 15 kc deviation and relaxed frequency stability requirements. All commercial f.m. and most amateur operation have replaced wideband techniques with narrowband.

Preselector/Converter [*from page 52*]

cable, the same technique being used to inject the oscillator signal into the mixer.

Power output for other gear is available on the back of the converter. Also on the back panel is an RCA jack connected to the local oscillator output with a two-fold purpose:

1. It can be used to feed the mixer a signal from an external v.f.o., for a coverage different from that obtained with crystals available.

2. It permits connecting an external variable capacitor to the mixer coils, thus tuning them. This is useful for "out of band" operation.

The cabinet is made in two halves, from 22 gauge copper plated steel sheet, painted red, after bending. The technique has already been described in footnote 1.

Tuning Procedure

After properly identifying each band on the bandswitch dial, all r.f. coils should be brought to the approximate operating frequency using a grid dip meter, adding fixed parallel capacitance where needed. The antenna trimmer is kept set at midrange. The mixer coils are tuned at midband, adding parallel capacitance if needed, and adjusting both trimmers and iron slugs.

Using the unit in the preselector mode, feed a signal to the antenna input, and check the S-meter of the companion receiver to make sure there is some gain. Bring the coil to peak tuning by further adjusting and checking the output of the preselector using the receiver S meter reading. The 100 kc calibrator comes in quite handy for this purpose.

Insert a crystal in the front panel socket and check oscillator operation: the base-emitter capacitive network and the coupling to the mixer are somewhat critical and may need components of slightly different values than those reported in fig. 1, depending on components used, crystals, layout, etc.

Acknowledgement

As usual, good ol' Maiso, PY2GP is to be thanked for tolerating my intrusion in his shop, and Tommy, PY2DFR helped with the pictures. ■

tries. A reader suggested that Herb Schoenbohm, KV4FZ, be the first individual covered, so here goes.

Herb was first licensed in 1954 as a high school student in Iowa City, Iowa. His call was W0VXO. DXing became his major interest in the early 1960's as a result of a *CQ* 160 Meter Contest which introduced him to the fun of contesting. At that time he was working his way through college as a night club entertainer, and found that coming home late at night and working DX on 160 went very well together. As W0VXO he worked 51 countries and all continents on 160.

In 1966 Herb began a series of 160 meter DXpeditions which soon became regular affairs. He put the following countries on 160, many for the first time ever: Peru, Brazil, Guadeloupe, St. Lucia, St. Kitts, St. Martin (FS7), Anguilla, Jamaica, Mexico, U.S. Virgin Islands, British Virgin Islands, Navassa, and Montserrat. He is a member of the RSGB, FOC, ARRL, Frankfort Radio Club, and the Florida DX Club, and holds several *CQ* Worldwide DX Contest records on both s.s.b. and c.w.

KV4FZ is presently employed as Director of Engineering for WSVI-TV, Channel 8, on St. Croix, and is West Indies representative for Gates Radio and for Electrovoice. His XYL is from Stuttgart, Germany and they have 2 sons. His gear is the Drake line with Hy-Gain beams and a shunt fed 70 ft. tower on 160.

From the Mailbag

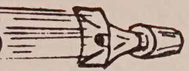
de Warren Croke, WA4DWR—"It would certainly be nice to pay tribute to some of those DX stations and QSL Managers who are very speedy in their response. In going through my log I find a Baker's dozen stations worked in the past 6 months who returned QSL's within 2 weeks. All were direct mailings, in many cases to addresses printed in the *CQ* DX column.

Some of the particularly prompt stations are FR7ZG (1 week), 3V8AL via W4WHF, FW8BO, via FK8BO, FK8AC, YB9AAJ via W7VRO, 7X2MD (4 days!!!), KP6AL via K3RLY, YJ8WP via WB4LWX, CR5BD (6 days), FL8MB, ZM1AAT/k via ZL2AFZ, AP2AD, and HC8GS.

The fact that some of these stations are fairly rare and no doubt up to their ears in QSL requests makes their speedy response even more noticeable and praiseworthy.

THE BIG SIGNAL

"W2AU" BALUN $12.95



S/STEEL
S/STEEL
S/STEEL
W2AU BALUN And LIGHTNING ARRESTER
Mfgd. By Unadilla Radiation Products Unadilla, N.Y.
MODEL 1-1
DBL PLATED SILVER SO239

IT'S WHAT'S INSIDE THAT COUNTS!

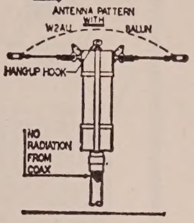
1. **HANDLES FULL KW INPUT—THEN SOME.** Broad-Banded 3 to 40 Mc.
2. **HELPS TVI PROBLEMS** By Reducing Coax Line Radiation
3. **NOW ALL STAINLESS STEEL HARDWARE.** SO239 Double Silver Plated
4. **IMPROVES F/B RATIO** By Reducing Coax Line Pick-Up
5. **REPLACES CENTER INSULATOR.** Withstands Antenna Pull of Over 600 Lbs.
6. **BUILT-IN LIGHTNING ARRESTER.** Protects Balun —Could Also Save Your Valuable Gear
7. **BUILT-IN HANG-UP HOOK.** Ideal For Inverted Vees, Multi-Band Antennas, Dipoles, Beam and Quads

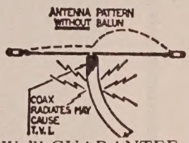
NOW BEING USED EXTENSIVELY BY ALL BRANCHES OF THE U.S. ARMED FORCES, FAA, RCA, CIA, CANADIAN DEFENSE DEPT. PLUS THOUSANDS OF HAMS THE WORLD OVER

***BIG SIGNALS* DON'T JUST HAPPEN— GIVE YOUR ANTENNA A BREAK**

Comes in 2 models. 1:1 matches 50 or 75 ohm unbalanced (coax line) to 50 or 75 ohm balanced load. 4:1 model matches 50 or 75 ohm unbalanced (coax line) to 200 or 300 ohm balanced load.

AVAILABLE AT ALL LEADING DEALERS. IF NOT, ORDER DIRECT


ANTENNA PATTERN WITH W2AU BALUN
HANG-UP HOOK
NO RADIATION FROM COAX


ANTENNA PATTERN WITHOUT BALUN
COAX RADIATES MAY CAUSE T.V.I.

We'll GUARANTEE no other balun, at any price, has all these features

UNADILLA RADIATION PRODUCTS
MFRS. OF BALUNS & QUADS
Tel: 607-369-2985
UNADILLA, N.Y. 13849
Dept. CQ

DRAKE C-4

Station Console puts you in COMPLETE CONTROL

C-4
DRAKE STATION CONSOLE

Model C-4 $299^95
Amateur Net

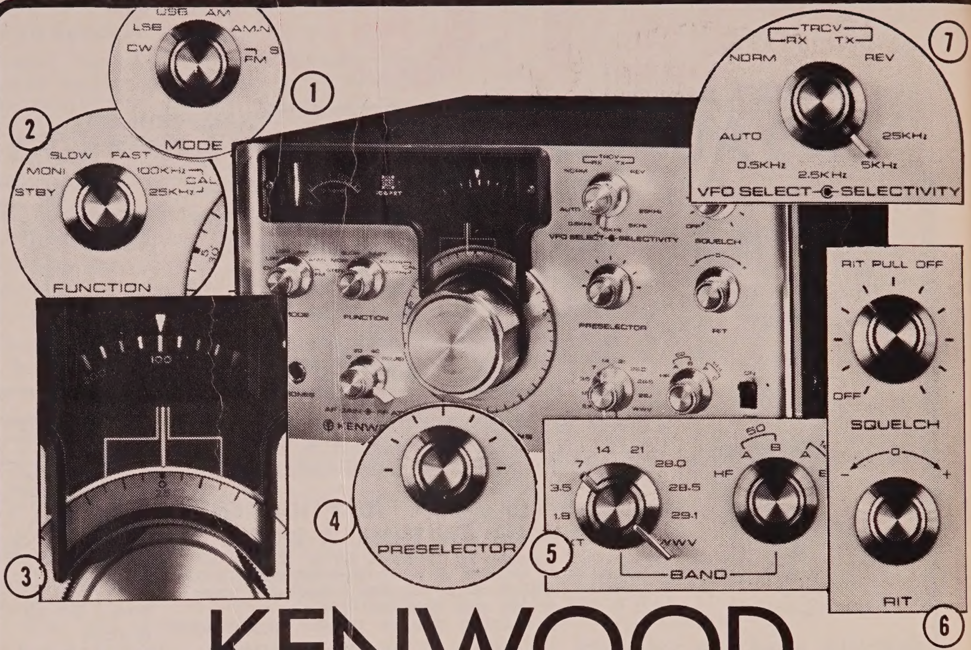
• **24 hour digital clock**—lighted, shows correct time to the second • **Solid state resettable timer** flashes light at identification intervals • **Station power control** with eight 120 VAC and two 240 VAC receptacles, front panel controlled heavy duty power contractor • **Equipment control switch** for changing exciters, rcvrs., etc. • **Directional RF wattmeter** with 200 or 2000 W full scale • **Built-in rotor control** for Ham-M • **Electronic phone patch** gives const. xmtr input, works PTT, meets phone co. requirements • **Remote motor-driven coax switch** selects from 5 antennas • **Dimens:** 10¾" W x 5½" H x 12¼" D., **Wt.** 24 lbs.

Puts complete station control at operator's fingertips . . .

Available at your local distributor.

R. L. DRAKE COMPANY

540 Richard Street
Miamisburg, Ohio 45342


USB
AM
LSB
AM.N
CW
FM
MODE
1
2
SLOW
FAST
MONI
100KHz
CAL
STBY
25KHz
FUNCTION
3
4
PRESELECTOR
5
14
21
7
28.0
3.5
28.5
1.9
29.1
WWV
HF
50
A
B
BAND
6
RIT PULL OFF
OFF
SQUELCH
0
−
+
RIT
7
TRCV
RX
TX
NORM
REV
AUTO
25KHz
0.5KHz
2.5KHz
5KHz
VFO SELECT—SELECTIVITY

KENWOOD

PUT IT ALL TOGETHER

UNIQUE FEATURES, SUPERB PERFORMANCE, HIGH STYLE . . . THE ULTIMATE IN VALUE. IN FACT, IF YOU CAN AFFORD KENWOOD (AND YOU PROBABLY CAN) THERE IS NO REASON TO BUY ANYTHING ELSE

Whichever is more important to you — quality or price — the Kenwood R-599 wins hands down. Check these features . . . they're standard! ① MODE — Permits reception of CW, LSB, USB, AM, AM with noise limiter, or FM. ② FUNCTION — Selects receiver position between: Standby, Monitor signal from T-599, Slow AGC, Fast AGC, 100 KHz or 25 KHz calibrator. ③ DIAL — ½ KHz readout, 25 KHz on subdial. ④ PRESELECTOR — Adjusts R-599 for maximum gain on desired receiving frequency by tuning for maximum s-meter reading. ⑤ BAND — 160, 80, 40, 20, 15, 10 meters (2 & 6 meters with accessory converters). ⑥ RIT — Allows off-set tuning of receiver when Kenwood units are operated in transceive configuration. ⑥ SQUELCH — Allows squelch feature for receiver, turns RIT off by pulling knob out. ⑦ VFO SELECT — Chooses VFO of either unit in transceive operation or allows each VFO to operate independently. ⑦ SELECTIVITY — Automatically selects appropriate filter for selected mode or choose 2.5 KHz filter for LSB and USB, 500 Hz filter for CW, 5 KHz filter for AM (and AM with noise limiter), and 25 KHz filter for FM. The R-599 $298.00. The S-599 speaker $14.50 • CC-29 2 meter converter $29.50 • CC-69 6 meter converter $29.50.

T-599 TRANSMITTER: Clear, stable, selectable side-band, AM and CW • 4-way VFO Flexibility plus Receiver Incremental Tuning (RIT) when used with the R-599 • Amplified ALC • Built-in VOX • Full metering, including cathode current, plate voltage, ALC and relative Power Output • Built-in CW Sidetone monitor and semi-automatic break-in CW • Built-in power supply • Maximum TVI protection • Easy calibration • Employs only 3 vacuum tubes • The price . . . only $345.00

KENWOOD IS AVAILABLE FROM ONE OF THE FOLLOWING DEALERS:

Henry Radio 11240 W. Olympic Blvd. Los Angeles, Ca. 90064 477-6701 • 931 N. Euclid Ave. Anaheim, Ca. 92801 772-9200 • Butler, Mo. 64730 697-3127

Adirondack Radio Supply 185 W. Main St. Amsterdam, New York 12010 842-8350

Amateur Electronic Supply 4828 W. Fond du Lac Milwaukee, Wis. 53216 442-4200

Amateur Radio Center 2805 N. E. 2nd St. Miami, Florida 33137 374-4101

Amateur Radio Supply 6213 13th Ave. S. Seattle, Wash. 98108 767-3222

Stan Burghardt 315 10th Ave. N. W. Watertown, S.D. 57201 886-3767

Douglas Electronics 1118 S. Staples Corpus Christi, Texas 78404 883-5103

Electronic Center 107 3rd Ave. N. Minneapolis, Minn. 55401 338-8461

Electronic Distributors 1960 Peck St. Muskegan, Mich. 49441 726-3196

Electronic Distributors 11324 Fern St. Wheaton, Md. 20902 949-2262

Freck Radio & Supply 38 Biltmore Ave. Asheville, N.C. 28801 254-9551

Harrison Rt. 110 at Smith-Farmingdale, N.Y. 11735 293 7990 • 8 Barclay St. N.Y. City 227-7922

Ham Radio Center 8342 Olive Blvd. St. Louis, Mo. 63132 993-6060

Ham Radio Outlet 999 Howard Ave. Burlingame, Ca. 94010 342-5757

Industrial Distributors 1209 S. Industrial Ave, Dallas, Texas 75207 742-8571

JRS Distributors 646 W. Market St. York, Penn. 17404 854-8624

Kass Electronics 2502 Township Line Rd. Drexel Hill, Penn. 19026 449-2300

Madison Electronics 1508 McKinney Ave. Houston Texas, 77002 224-2668

Portland Radio Supply 1234 S. W. Stark St. Portland, Or. 97205 228-8647

Radio Distributing Co., Inc. 1212 High St. South Bend, Indiana 46624 288-4666

Western Radio 1415 India St. San Diego, Calif 92101 239-0361

World Radio Labs 3415 W. Broadway, Council Bluffs, Iowa 51501 328-1851

QSL Information

A2CAW—Via WB8BTU.
AP6DQ—To W2GQN.
CR3KD—c/o WA4PXP.
CS5CX—Believed to be a pirate.
CT2BD—Via WA8SVU.
EL2BA—To WA2DHF, 551 Broadway, Amityville, N.Y. 11701.
ET3DS—c/o VE3ALC.
FB8XX—Via F2MO.
FL8HM—To W9FN.
FM7WF and FM7WQ—Via W2GHK.
FO8BO—NOT via WA6TQK, send direct or to FO8AA bureau.
FR7AF—c/o F6AXP.
GI5AHS—Via WA2DHF.
GM5AHS—To WA2DHF.
HK0AI—c//o W9WHM.
HS3AEN—To P.O. Box 1024, Grand Junction, Colorado.
HV3SJ (March 16-23 QSO's only)—Via DL1CU, P.O. Box 585, 7 Stutgart 1, Germany.
JA6YAO—To W1FJJ.
JD1ABO—c/o JA1BA.
JW5NM—Via LA7RB.
K8HKB/HK0—To W8GDQ.
KA1MI—c//o W6ANB.
KG4EY—Via WA2IRS, 31 Sunset Ave., North Arlington, N.J. 07032.
KG6IF—To W6ANB.
KW6HA—Via WB6ZZX.
M1B—c/o WA3HUP.
MP4BIK—Via G3EIY.
PJ9AF—To W3KMV.
PJ0CW—c/o W1FJJ.
SM7TV—Via WB4LKC.
SP3DOI—To W2KF.
ST2SA—c/o K3RLY.
TR8MC—Via W2YY.
TT8AD—To F2MO.
TU2DD—c/o K2QHT.
VK0HM—Via F2MO.
VP2AAA—To W4DQS.
VP2EZ—c/o WA9VOL.
VP2ML—Via W1IIM for recent operations, to WB8ACF for contacts Dec., 1967 to Jan., 1969.
VP2VV—Via VE3ACD.
VP5CC—To WB4MKU.
VP5JA—c/o K4DSN, 6563 Sapphire Drive, Jacksonville, Fla. 32208.
W9UCW/HK0—Via W8GDQ.
W0EXD/KC4—To W4OHP.
W0KUS/HK0—c/o W8GDQ.
WA1ARF/KS4—Via WA6MWG.
ZA2RPS—To DL7FT.
ZD7BB—c/o WA0WKW.
ZD8AY—Via K3RLY.
ZS1MH—To WA1LDA.
4X4OG—c/o W2BHK, 1 Saddle Ridge Rd., Ashland, N.J. 08034.
5V0AT—Via VE2DLQ.
6W8DY—To VE4SK.
7P8AB—co W2LGU.
8P6DQ—Via W2GQN.
9J2GE—To W2GA.
9Q5BV—c/o WA2MSF, 110 Sycamore Circle, Stony Brook, N.Y. 11790.

73, John, K4IIF

WHAT'S A CLASSIFIED AD IN CQ WORTH?

NOTHING!

Unless, of course, you happen to have something to sell . . . or buy . . . or swap . . . Then you can only measure the value in satisfaction, time saved, etc. Of course, a typical classified ad in the other major ham magazine costs between $2.50 and $3.00, so maybe that's a way to measure.

Now—What does a classified ad in CQ cost?

NOT A RED CENT ! ! !

That's right, you read us loud and clear. CQ subscribers can run non-commercial classified ads any and every month absolutely free of charge. All you have to do is send us your mailing label, on a postcard, as proof that you're a subscriber, with your ad neatly typed or printed. There's a limit to three lines in any single month to make space for everybody to get in that needs to.

SO—What's a subscription to CQ worth? Well, maybe twelve months of great reading, maybe twelve months of free classified ads, maybe both. That's up to you. In any case, at $6.00 a year, CQ is a steal. Do we have your sub yet? If not, why not?

Ham Shop

ADVERTISING RATES: Non-commercial ads 10 cents per word including abbreviations and addresses. Commercial and organization ads, 35 cents per word. Minimum Charge $1.00. No ad will be printed unless accompanied by full remittance.

Because the advertisers and equipment contained in Ham Shop have not been investigated, the publishers of CQ cannot vouch for the merchandise listed therein.

Direct all Correspondence & Copy to:

CQ Ham Shop, 14 Vanderventer Ave., Port Washington, L. I., N. Y. 11050.

FOR SALE: Brand-New AN/ART 13 AUTOTUNE Transmitter complete with tubes and the original operations manual, $50.00. Also, Brand-new BC-1031 Panadapter (455 KHZ) with tubes and manual, $70.00. Both for $110.00. W3RYJ, RD 4, Box 368, Reading, Pa. 19606.

NO TIME TO OPERATE HALLICRAFTERS SR-400 and AC PS-500A, one yr. old, always kept covered, VY low time, new condx., $550. Swan 175 & 240-12 DC, Mike, Band Scanner Ant., $175. Knight TR-108 2 mtr. Xcvr. w/fm added, 6 xtals, $85. Gene, W7WHX, 1119 N. Baker Ave., Wenatchee, Washington. 98801.

TRANSCEIVER NCX5 Mark 2 with AC power supply, factory overhauled perfect $350.00. Sonar Transceiver 10-15-20 meters 200 watt Pep SSB w/ factory AC and DC supplies, $300.00. Swan power supply model 117XC and 14X DC Module, $70. Communicator 4, 6 meter transceiver mike and 5 crystals, $150.00. Manuals for all units. Gerald Tetrault, RFD 4, Box 165, Manchester, N. H. 03102.

KNIGHT G-30 Grid dip meter, $20; HD-15 phone patch, $18; KNIGHT KG221 FM monitor receiver, $30; Quement 2 MTR SWR Bridge, $10; New unopened HP14 power supply Kit, $50; Drake TR-3 AC-DC Supplies Mike, $400.00 or best offer. Ameco Nuvistor Cascode Preamp, $25; Tower-Mosley-TA33-HAM M & Cables, $150.00. Purchaser must dismantle. Reginair Quad, $60.00, purchaser must dismantle. SHIPPED COLLECT - to settle estate D. Rigau, Box 685, Gloucester, Va. 23061. Phone: 693-4258.

GREENE—Guaranteed water-tight center insulator, with, or w/o BALUN, a tough item to beat. Flier free. GREENE INSULATOR. Box 423, Wakefield, R. I. 02880.

YOU ALL COME TO INTERNATIONAL INDEPENDENT COUNTY HUNTERS CONVENTION in Kansas City, July 2, 3, 4, 1971. SASE to WA0SHE, for information.

WANTED: HRO coils A, B, D, and E. Advise condition and price. WA6QVS, 428 — 28th St., Richmond, California. 94804. (415) 232-3427.

WANTED: Bird Wattmeter Model 43 Elements for 100-250 mc and 0-30 mc Range. Write: WA0SMR, 601 Maple, Box 107, Overbrook, Ks. 66524.

PMO 0-459 URT, TMC. RF osc and exciter, 2-4 mc fundamental. Unconditionally guaranteed, fully calibrated, manual included. Earl Castine, 11522 Goodloe Rd., Silver Spring, Md. 20906.

WRL Duo-Bander 84, with A.C. power supply. $150.00. W9TUL, Wm. Hill, 613 Badger Ave., South Milwaukee, Wis. 53172.

I WILL BUY HAM GEAR. Kit projects gone wrong. Heath preferred. State defects in general and firm price in first letter. All inquiries answered. Paul Wynne, WA5YMW, Box 9284, Little Rock, Ark. 72209.

WESTERN CANADIAN TEN-TEC DEALER. Write SYSTRONICS, 8302- 151st St., Edmonton, Alta.

WANT OLD TELEPHONES OR PARTS Prior to abt 1935. Also want video tape for model 2000, G.E. (Sony) V.T.R. WN-6-DZD, 3208 Washington St., Alameda, Calif. 94501.

COLLINS S-Line and other gear for sale, SASE for Complete detailed list. J. Lynch, Box 9638, 533 East Dunlap Ave., Phoenix, Arizona. 85020.

SELL: QST Jan. '61 thru Aug. '68. Short Wave Magazine (English SWM) Nov. '61 thru Apr. '66. DX Magazine (Don Chesser's) Apr. '59 thru Feb. '64. 73 Magazine Aug. '66 thru Mar. '67. Make offer. O'Brien, W2EQS, 190 Knickerbocker Rd., Apt. 9, Englewood, N. J. 07631. Phone: (201) 871-0030.

CREATE A QSL with a "Sampler Instruction Kit" 25 cents. SAMCO, manufacturer of (XTRA-CLASS) and regular printed QSLS. Write: SAMCO, Box 203, Wynantskill, N. Y. 12198.

RUBBER ADDRESS STAMPS $2.00. Signature, $3.50. Free catalog. JACKSON's, Box 443F, Franklin Park, Illinois. 60131.

WANT: Antenna Books LaPort, Harper, Jordan, Kraus, OSRD (propagation), Keen (df). W3AFM, P.D. Rockwell.

SELL: 74 Midget variable condensers with knobs. Approx. 250 mmfd. Never used. Offer? Also 2 bound volumes CQ Magazine 1966/1967. Offer? Also 2 — 810s, $15 each or both for $25; 4 — 872s, $5 each or all for $15; 1 — 866, $2. O'Brien, W2EQS, 190 Knickerbocker Rd., Apt. 9, Englewood, N. J. 07631. Phone: (201) 871-0030.

MANUALS: $6.50 each: R-390/URR, R-390A/URR, BC-639A, CV-591A/URR, BC-348JNQ, OS-8c/U, SP-600JX. Hundreds more. W3IHD, 4905 Roanne Dr., Washington, D. C. 20021.

SELL: Galaxy 5 with AC and DC supplies, VOX, matching speaker, Astatic 10-DA mike and G-stand. $300 or best offer. K5IKL, Route 1, Box 250, Deming, N. M. 88030.

HEATHKITS wired 15% of cost. Price, reference on request. SASE, P. O. Box 6144, Linglestown, Penna. 17112.

HOBBYISTS: Electronic components at huge savings. Transistors, 2N3566 and 2N3567, 6 for 25 cents, 2N3638, 4 for 25 cents, capacitors 10 cents, carbon resistors, 5 cents. Thousands of components. Catalogue free. SASCO ELECTRONICS, 1009 King St., Alexandria, Va. 22314.

FOR SALE: Swan 500-C, 117X-C, Knight SWR bridge, digital clock, EV619 mike, B & W coax switch, Dow Key Coax Relay, Mosley TA-33 Jr., and rotor, much more. Don Rubin, WA3JRA, 3919 Bancroft Rd., Balto., Md. 21215.

CLEANING HOUSE? Large stock of receivers, transmitters, tranceivers, VHF gear, test equipment, RTTY gear, Misc. parts, etc. Advise what you need. Send stamp for list. J. R. Shank, 21 Terrace Ln., Elizabethtown, Penna. 17022.

4X150A TUBES, $5.95 POSTPAID Removed from equipment. Test to specs; guaranteed. Minimum—two tubes per order. Mail check with order. JSH Electronics, Inc., Dept. CQ, P. O. Box 2898, Culver City, California. 90230.

WANTED: R390, R390A, R389, 51J4, 51S1, Racal, Nems-Clarke, Marconi Receivers. SWRC, P. O. Box 10048, Kansas City, Missouri. 64111.

POSTAL CHESS: American Postal Chess League, Box 1022, Greeley, Colorado. 80631.

QSL Manager. Will volunteer my services. W7HKL, D. G. Larry Larison, Traveler's Lodge, Edmonds, Washington. 98020.

NOVICES: Need help for general ticket? Complete recorded audio-visual theory instruction. Easy, no electronic background necessary. Write for free information. AMATEUR LICENSE, Box 6015, Norfolk, Virginia. 23508.

GET YOUR FIRST! Memorize, study "1971 Tests-Answers" for FCC First and Second Class License, Plus "Self-Study Ability Test". Proven. $5. COMMAND, Box 26348-F, San Francisco, Calif. 94126.

FOR SALE: 28-Point Bristol Strip Chart Recorders, Okonite Rubber Tape, $4/box of 10 rolls. (Quantity prices available); AC4A (Hewlett-Packard) Plug-in Decades, $7; New Dual Cage Blowers, $7; Trammell, 1507 White Oak Ct., Martinsville, Virginia. 24112.

SELL: LI AREA PKUP. Plate Xfmr 13; 1 T.R. CT SEC 1500 V @ 500MA; 45 lbs., 2 chokes; 2-866 Fil Xfmrs cased, $20. W2VR, 2 Wood Haven, E. Northport, L. I., N. Y. 11731.

COMPLETE STATION: SB102, CW Filter, power, SB640, Patch, and Ham-M control and Freq Meter/SWR meter in Heath cabinets, Hunter 2000B, mike, Johnson Matchstick, Cables, Spare parts. Write/call for details and picture. $1050. Motorola enclosed 6' rack, $20. W0YVA/4, Bob. 4423 N. 17th St., Arlington, Va. (703) 524-2398.

FOR SALE OR SWAP: Issue of CQ, QST ..... magazines. Also 100 feet of aluminum covered coax. Edwin A. Fensch, W8SOU, 474 Parkview St., Mansfield, Ohio. 44903.

TV-10B/U mutual conductance tube testers. Good condition, $80.00; TV-3B/U tube testers, $75; Frequency meter, TS-186/UP, $100; Flux meter TS-15 C/Ap, $75; Multimeter ME-6D/U, $20; TS-175, $100. Mike Tewksbury, Box 8324, Norfolk, Va. 23503.

DRAKE L4B. Excellent condition. Will not ship. Prefer Indiana sale. $600.00. WB9BEF, 202 King Arthur, Franklin, Indiana. 46131. Telephone: (317) 736-7377.

WANTED: Accessories for Galaxy V, DC-PS, Vox, Cal, Console, etc. P. O. 97, South Point, Ohio. 45680.

SELL: EICO 753 Factory-wired with Adcom A.C. Power Supply, Works F.B. $130.00, Elmac PMR-6A with A.C. Power Supply (home brew) $30.00 great SWL rcvr. Gould, 7951 Sausalito Ave., Canoga Park., California. 91304.

SELL: New 75-40 meter Mars Mobile Xmtr. Pwr Supply. Mike $40.00. LaVern Smith, 3104 Catherwood, Indpls., Ind. 46226.

WANTED: Heath SB-10, SSB Adapter. Must be in gud condx. Will pay postage. Name your price. WA6WNK, Darryl D. Solus, P. O. Box 536, Seiad Valley, California. 96086.

CONTESTERS — Ohio, Indiana, Kentucky. Openings in MVARCS. For info., contact W8JLO.

SPRING SHACK CLEANING Beckman 7170 counter, $125; Paco B-12 supply, $20; Simpson HV303 probe, $5; Lambda C481M supply, $40; BC-348 as is $15; New car radio tubes, $1 each; Raytheon 250W & 500W regulating trans. $10 each; 110V trans. 2-75amp sec.6.3V $12; Paco G-32 gen., $40; Measurements 79 Gen., $25; Monitor receivers HB?; Robert Ireland, Pleasant Valley, N. Y. 12569.

MINT LATEST MODEL HAMMARLUND HQ180-AC General Coverage Receiver with clock, $285. Hustler 4BTV Vertical, $30.00 FOB. Jakob Bara, Greenough, Montana. 59836.

WANTED: Vertical (Hill & Dale) Magnetic Phono cartridge. Ray Caldwell, W4VFC, 525 Hall's Ln., Madison, Tenn. 37115.

100 TWO COLOR GLOSSY QSL CARDS, $3.25. W3LXY, 118 Mill Creek Ave., Pottsville, Pa. 17901.

NATIONAL HRO-500 Receiver with speaker, very good condx, $700. Heath SB-620 Hamscan. Good shape, $70. Transceiver power supply, needs capacitors, xfmr ok, $35. WANTED: 5-6 element 20 meter beam, Mainline or ST-6 RTTY converter. W1BRJ, 7 Pickwick Rd., Marblehead, Mass. 01945.

TRADE: Leica M-3, f1.5, Mtr., 85mm Canon f2 for gud xcvr. or lab caliber test gear. D. D. Callaghan, 233 Mohawk, Tiffin, Ohio. 44883.

QSL PHOTO STAMPS: Glossy Free Samples. B & C ENTERPRISES, P. O. Box 49C, Luray, Virginia. 22835.

HAMFESTERS 37th Hamfest and Picnic Sunday, August 8, 1971 Santa Fe Park, 91st and Wolf Rd., Willow Springs, Illinois, Southwest of Chicago. Exhibits for OM's and XYL's. Famous Swappers Row. Information and tickets, Joseph W. Poradyla, WA9IWU, 5701 S. California Avenue, Chicago, Illinois. 60629.

FOR SALE: 1 KW 813 PEP Grounded Grid Linear new, never used. $45. E. R. Norris, 830 Montgomery Avenue, Bryn Mawr, Penna. 19010.

WANTED: HAMMARLUND HQ180 AC or HQ180 AX, with S-200 speaker if possible. J. L. Green, 165 Forest Ave. E., Apt. 1, Hamilton, 20, Ont., Canada.

STILL FIGHTING IGNITION NOISE? Data sheet with suggestions plus information about latest device designed to fight pollution that turns out to be amazingly effective with most ignition noise problems; truly a good lesson in electronics. Send $1.00, refundable. W0BNF, Box 105, Kearney, Neb. 68847.

SELL: Hallicrafter HT32, perfect condition, instruction manual. $175. Also, dehumidifier, perfect condition. $50. Cash & carry. O'Brien, W2-EQS, 190 Knickerbocker Rd., Apt. 9, Englewood, N. J. 07631. Phone: (201) 871-0030.

BC-610 Xmtr with speech amp, junction box, coils, tuners, cables, manual. $200. S. N. SILBERT, White Sulphur Springs, N. Y. 12787.

ANTENNAS RAISED: Indianapolis Area, or will travel. Bob Perring, WA9HMY, 3842 Parkwood, Indianapolis, Indiana. 46254.

WANTED: Used-Drake TR4, AC Pwr, speaker; Drake L4B Linear w/pwr; Drake MN-2000 Netwk.; Collins KWM2, AC pwr & spkr; Collins 30S1 Linear with power. H. F. Cushing, W6LXZ, 5224 Bobbie Avenue, San Jose, Calif. 95130.

WANTED: Mosley CM-1 rcvr. W6DOR, 4100 Worthington Dr., N. Highlands, Calif. 95660.

LICENSING COURSES: The LERC Amateur Radio Club regularly conducts Ham Courses open to all Los Angeles area people. Write: 2814 Empire Ave., Burbank, Calif. 91504, for details.

LOUISIANA. SX101A, $195; TR4, AC4, MS4, $535.00; RTTY Mod. 19, $125; RTTY TU, $50; Pickup only. 364-7796. Mac, 113 Woodcrest, New Iberia, La.

WANT ARRL HANDBOOKS, 1960, 1970 ed. Must be clean. $2.00 ea. incl. postage. M. Bae, Box 95, S. Branch, N. J. 08881.

QST FOR SALE: 1955 thru 1970 (1961 thru 1966 in binders). Best offer. Bob, W0YVA, 4423 N. 17 St., Arlington, Va. 22207. 703-524-2398.

MECH. FILTERS: 455 Khz, 2.1 khz, $18.95. 300 Hz, $22.95. J. Fredricks, 314 S. 13th Ave., Yakima, Washington. 98902.

WANTED: HW-32, 22, 12 non-working, for parts purposes. Will pay $30. Must be intact. R. Guard, 750 Lily Flagg Rd., Huntsville, Ala. 35802.

SELL: DX60, HR10 package, $100.00; Drake 2C with cal, 2CQ, 2Nt, New very little use. No reasonable offer refused. You pay shipping. D. Parks, 1776 Walnut St., Coshocton, Oh. 43812.

KILOWATT GOODIES, SSB transceivers, CW/AM Xmtrs, RCVRS, specialty items, etc. All excellent. No junk. SASE. Bill Lindblom, 512 Grandview, Chillicothe, Mo. 64601.

FOR SALE: Instructograph, elec. powered with oscillator & ten tapes, $25. FOB Phoenix, Az. W6-DHW/7, A. Reade, 2231 E. Mulberry St., Phoenix, Az. 85016.

RCA CARFONE. Make offer. WA2FFZ, 186 West Ave., Pitman, N. J. 08071. (151 MC).

FOR SALE: BC Rcvr, shielded, compact, useful as tuneable i.f.—$5. No-ham xtals, over 30 — $2. W2—CVW, 13 Robert Cir., S. Amboy, N. J. 08879.

SELL: HX10 Marauder, 80-10 Xmtr, SSB, CW. FSK-AM-Mint condx. $150.00. Gross, W2OXR, 79 Howard Ave., Staten Island, N. Y. 10301.

WANTED: Automatic reporting telephone dialer—dials prerecorded phone number and gives taped message. Will pay cash or swap Model 28 Teletype units. W9YVP, 8280 S. Tennessee, Clarendon Hills, Ill. 60514.

SELL/SWAP: Heath HM-15($12), HD-15($20), HD-16($9). All mint. WA1JFG, 120 Oaktree, N. Kingstown, R. I. 02852.

QST's from 1917, CQ's from 1945, One or a hundred, send your want list for a quotation. Erv Rasmussen, W6YPM, 164 Lowell St., Redwood City, Calif. 94062.

CHEAP SSB: SX-146 RX $145. Will transceive w/ HT-46 TX $165. Both excell. condx. K3FOD, 925 Coleridge Rd., Balto., Md. 21229.

SELL: Lampkin Freq. meter, type 105B, S/N 1757, with Eng. Data & graphs. Make offer. W6-DOU, 3154 Stony Point Rd., Santa Rosa, Ca. 95401.

FOR SALE: Swan 350 117XC AC supply and 14X DC supply $350.00. Used 10 hours, excellent condx. Norm Riquier, W1GNS, 78 Norwood Rd., Bristol, Conn. 06010. Telephone (203) 583-3957.

75A2 Rcvr with Vernier Dial and Collins Filter Kit and two filters $200.00; HW-22, $80.00; Heath HX-20 and supply, $125.00. New 6C21 tubes, $15, Model 14 Base, $10; both for $15.00. W8CEG.

FOR SALE: R4B — T4XB, Power Supply and Speaker, $750.00. Heath Kit SB220, $325.00. Bob Steinberger, 1184 Morris Ave., Green Bay, Wisconsin.

ROHN-TOWER 55 feet, six sections for Ham Quad or Beams. Top section allows either inside or outside rotor installation. Tower can be guyed or house bracketed. Stainless mounting hardware. All in good condition. First check for $95.00 will include shipping. D. E. Pelrine, WB4KIS, P. O. Box 2214, Burlington, N. C. 27215.

ROCHESTER, NEW YORK — Rochester is the location for the 38th Annual Western New York Hamfest and VHF Conference on Saturday, May 15th. New location is the Monroe County Fairgrounds, Rte. 15A, just north and east of N. Y. Thruway exit 46. Special activities include Navy MARS, AREC and QCWA meetings, YL fashion show, code contests and huge flea market. Advance registration and banquet only $6.75. Unlimited registration (includes entire Hamfest except dinner) only $2.75. Advance sale closes May 8th. Send check to Western New York Hamfest, Box 1388, Rochester, N. Y. 14603.

SELL: Swan 350, with VOX, crystal cal., 117C pwr supply, late model, mint condx, $300.00. WK-Pep Linear, $100.00, less pwr supply. K9MWA, 609 Henrietta, Gillespie, Ill. 62033.

FOR SALE: Mint condition HT-37 $165. SX-117 with speaker, $215. Both for $365. Bob Scheib, 1316 S. Duff, Ames, Iowa. 50010.

HOOSIER ELECTRONICS Authorized dealers for Drake, Hy-Gain, Ten-Tec, Galaxy, Regency, Hallicrafters. All equipment new and fully guaranteed. Write today for our low quote. HOOSIER ELECTRONICS, Dept. E, R.R. 25, Box 403, Terre Haute, Indiana. 47802.

JUNE 6, 1971 — Save this date for the Annual Starved Rock Radio Club Hamfest. Same place as last year. Details on request. Write SRRC/W9MKS, G. E. Keith, W9QLZ, Sec'y-Treas., RFD 1, Box 171, Oglesby, Illinois. 61348.

FOR SALE: Simpson 381. Capacity bridge, range 5 m.m.f. to 500 m.f.d. $12.00. H. Greenberg, 821 Rutgers Rd., Franklin Square, N. Y. 11010.

MUST SELL: 2 Communicator II's, 2 meters good condx $60.00 each. HB Linear 4-400, no Pwr Sup. HB final 2 - 813's with pwr. $50.00. Heath Sixer, $25.00. W3INW, 222 Housatonic Ave., Stratford, Conn. 06497.

QSLS. SECOND TO NONE. SAME DAY SERVICE. Samples 25 cents. Ray, K7HLR, Box 331, Clearfield, Utah. 84015.

WANTED: Heath SB640 External LMO. Must be in mint condition, with manual. R. E. MacIntire, W8WOM (1 - 216 - 867-2293) 2532 Falmouth Rd., Akron, Ohio. 44313.

SELL: Surplus ARC-5, SCR-274, SCR-522, SCR-284 gear, new and used. TG-34A-Keyer plus tubes, parts, etc. W2VEZ, 230 Schiller St., Buffalo, New York. 14206.

SELL: USM 32 Oscilloscope, $60; FR4/V Freq. Meters, $75; RBA, RBB and RBC General Cov. Rcvrs, $50. Variacs, all sizes, Digital VTVMs, $50. Trammell, 1507 White Oak Ct., Martinsville, Va.

SELL: AMECO TX62 TRANSMITTER 2 meter 50 watts, $100.00. AMECO VFO621 for 50-144-220 MHz, $40.00. AMECO CN144 converter for 2 meters incl. PS $45.00. Bean, 205 Ellinger Ave., Ft. Washington, Penna. 19034.

WANTED: Non-working HW 12, HW 22, HW 18-or Duo-Bander W/or wo power. State condx and lowest price, if willing to ship: Heuberger, WA1IUR, 51 Maynard, Seekonk, Ma. 02771.

ROHN 50' tower, AR22, 20 mtr beam, all hardware. Cables and guys, all for $100. WA5NYG, 3407-47th Street, Metairie, N. O., La. 70001.

SELL: NCX-500, AC-500, new, in cartons, $320. Collins 32V3, HQ-129X, phone patch etc., like new. $285.00. All types of surplus equip., new & used, bargains! W2VEZ, 230 Schiller St., Buffalo, N. Y. 14206.

FOR SALE OR TRADE for ham gear: Warner 100-B plastic laminating press and supplies, used very little. Cost over $700, sacrifice $450. Local deal preferred. William Soon, 649 S. Ynez, Monterey Park, California. 91754.

SELL: CQ, March 1953 to present (plus 4 older); QST, Jan., 1947 to present (3 gone); ARRL Handbooks for 1939, 1951, 1954, 1959, 1961 and 1963; old callbooks. Make offer. K8SVM, 2641 Windlow Dr., Dayton, Ohio. 45406.

2 METER TRANSMITTERS: Surplus Model TDQ, 45 watts AM, new, 115 V60 cycle, $125.00. Aero, 900 G, Rio Linda, California. 95673.

FOR SALE: DX60 HR10, package $100. Drake 2C, 2CQ, 2NT package used little, like new, you ship. No reasonable offer refused. Dan Parks, 1776 Walnut, Coshocton, Oh. 43812.

WANTED: Telrex-Tri-Band Beam. Robot SSTV. Mike Ludkiewicz, 143 Richmond Rd., Ludlow, Mass. 01056.

CRYSTALS for all ham bands up thru 220 Mhz. Send stamped envelope for bargain list. W6DOR/W7BYF, 4100 Worthington Dr., North Highlands, California. 95660.

I WANT SOME 500 Khz MECHANICAL FILTERS, various band widths. What have you? Must be reasonably priced. W. Small, W6LZX, 27828 E. 15th St., Hayward, California. 94544.

FOR SALE: Squires-Sanders SS-1R, SS-1RS, SS-1S (new)$550. SB-200, new spare tubes, $215. SX-115, $275. KWM-1, 516F-1, 351D-1, 516E-1, $325. Galaxy 300, PSA-300, $185. Viking Thunderbolt, $250. 66'er, $125. 32S-3, No. 101, 493, 516F2, $725. J. W. Craig, 29 Sherburne Avenue, Portsmouth, N. H. 03801.

WILL TRADE MODEL 28 TYPING UNIT, mint condition, for a Model 28 Keyboard or Model 28 Cabinet and Lesu. Geo. Cherney, WA8TND, 4986 Leavitt Rd., Lorain, Ohio. 44053.

FOR SALE: Heathkit HO-10 perfect, $45.00. Collins 516EI 12VDC supply, $50.00. John Kersten, W0BGK, 717 Crest Ave., Ft. Dodge, Iowa. 50501.

LINK Hi-Band Base Station 24 tube 50 watt out, $85. LINK 2-meter mobile 20 tube 829Bout, $25. John Wasiewicz, W2DQC, 229 Sarles Ln., Pleasantville, N. Y. 10570.

BC-610 Xmtr with speech amp, junction box, coils, tuners, cables, and manual. $200. Silbert, White Sulphur Springs, Box 77, N. Y. 12787.

FOR SALE: EICO 753 TRIBANDER with matching Eico AC power supply. Working perfectly. Like new condition. $125.00. WA1BZS, 106 Wallace Row, Wallingford, Conn. 06492.

FOR SALE: New Cesco SWR & Relative Power meter, $25.00. K3YMN, 2185 Sampson St., Pgh., Penna. 15235.

SIXER: Used once. Needs work. You pay shipping. WA2FFZ, 186 West Ave., Pitman, N. J. 08071.

BARGAINS: XFMRS, CHOKES, TUNING CONDENSERS, TUBES, HAM GEAR, MAGAZINES, E. Tischler, 58 Carey Ave., Wilkes-Barre, Pa. 18702.

51J/R388 w/maint book, $275. Hallicrafters HA2 2-mtr Xverter w/PS $125. Bill Wakefield, 2704 Powderly Ave., Birmingham, Ala. 35211.

WANTED: Postal Telegraph & Western Union items of any kind. Goodman, 5826 S. Western, Chicago, Illinois. 60636.

FOR SALE: Back issues 73 early 60's CQ—late 60's. 15 cents each. 12 for $1.50. List for s.a.s.e. E. Erickson, 13 Robt. Cir., S. Amboy, N. J. 08879.

SX146, complete, mint condition, $175, plus shipping. Also fair SX71, $55 FOB. B. Pollock, WA2IBE, Box 215, Ironia, N. J. 07845.

THE OLD OLD TIMERS CLUB desires your membership. If licensed for 40 years, just send your QSL card to Chas. W. Boegel, Jr. W0CVU, 1500 Center Point Rd., NE, Cedar Rapids, Iowa, 52402, for an application.

FOR SALE: NC-190 receiver, good condx general coverage $100. APX-6 transponders, all new w/new tubes, $25 each. Ship express collect. F. W. Abide, Jr., Box 146, Leland, Miss. 38756.

TOWER WANTED: 54 feet or higher, medium or heavy-duty. Give model, age, cond., and price. A. Emerald, 8956 Swallow Av., Fountain Vly., Calif. 92708.

KWM-2, AC DC PS, Misc. Stn. equip. Excell. cond., $775. or ??? WA6GZZ, (916) 331-2185, Ca.

COAXIAL FITTINGS. SO-239 .18; PL-259A .30; UG106U .05; UG-290U .10; UG-262U .20, add postage. Ken Maas, Burlington, Wisconsin. 53105.

HW-16 CW Xcvr and HG-10 VFO, excellent, together $85 or best offer. WA3MQJ, D. Yao, 101 Arbor Drive, Pittsburgh, Penna. 15237.

SELL: Mechanical filters. 455 Khz. 2.1 Khz, $18.95. 300 Hz, $22.95. J. A. Fredricks, 314 So. 13th Ave., Yakima, Washington. 98902.

FOR SALE: G28-10M Comm. $125; GPPI Phone Patch $30; DX-40 Trans. $50; Heath 10'er $50, WB9FHQ, Bob Cook, Rt. 1, Box 132A, Warrenville, Ill. 60555.

WANTED: Heath HD-10 Keyer. Will swap Eico 753 for it. John, WA7NWL, 4634 E. Cypress, Phoenix, Arizona. 85008. 602-275-3000.

TOROIDS, 88 mh, uncased, 5/$1.50 PP 48. E. W. Evans, K4OEN, 220 Mimosa Ln., Paducah, Kentucky. 42001.

WANTED: Manual for RBA-1, will buy or borrow to photocopy. J. W. Pinner, 1380 Lamar, No. 406, Memphis, Tenn. 38104.

AN/FRR3A dual-diversity RTTY $120; Beckman counter $35; electrostatic copier $35. SASE for 3-page list, please. WANT: handgun, S-94, S-95, SX-73, telescope. WA9DYE, 114 Lakeview, Milwaukee, Wisconsin. 53217.

HAM MUSEUM WANTS following historical equipment unmodified and working: KW-1, Cosmophone 1000, Heath HW-14 and power supplies. W7BIF, 107 Wyoming St., Boulder City, NV 89005.

LAFAYETTE HA800 Solid State Ham Recver. Brand new, $80.00. Transcom Solid State Tribander Transceiver, with PS/SPKR, $160. Swan VOX VX2, $23.00, Hammarlund HQ170C, $150, Lafayette VTVM No. 38FO1016W. $20. All excellent. F. Colella, 105-18 131st St., Richmond Hill, New York. 11419.

28ASR and KSR floor console cabinets for sale or trade. Can use Tektronix 315, 317, or 310 scope & other test equipment. D. C. Harrington, 1620 Gardenia Ave NE, Fridley, Minn. 55432.

WANTED: Pilots and aviation electronics & communicators, air and ground, to join the International Flying Hams' Club, now 1550 Members World-wide. Write to FHC Executive Secretary. Clif Evans, K6BX, 3212 Mesa Verde Rd., Bonita, Calif. 92002.

MOST RANGES, PANEL METERS only $2.00 ea., plus shipping. SASE for listing. 4CX250R/7580W's R.F.E., $3.00. Samkofsky, 201 Eastern Pkwy., Brooklyn, N. Y. 11238.

WANTED: Members in new Police & Fireman's Ham Club which is part of the largest ham organization in the world. Write to: W6CCM, Dave Manescu, 13227 Beechtree St., Lakeside, California. 92040.

ARE YOU a blind or paralyzed ham or do you know a B. or P. ham? B/P's are invited to join the world's biggest ARS club with members all over the world. No dues or fees to the B/P for International Friendship and 'vision'. Write to K6BX, Executive Secretary, Int. CHC, 3212 Mesa Verde Rd., Bonita, Calif. 92002.

SELL: Hewlett-Pack. 450-A Amp., 20 to 40 Db. gain, with manual, Exc. cond. $45.00. W4JGO, 643 Diamond Rd., Salem, Virginia. 24153.

WANTED: Transceiver, vertical antenna. M. Hoshiko, 707 So. James Street, Carbondale, Ill. 62901.

SELL: Galaxy V Mk2, AC400 Power Supply Calibrator, $320. H. G. Overeynder, W6IWR, 12080 Country Sq. Lane, Saratoga, Ca. 95070.

GALAXY Updating-Info to bring up earlier Galaxy up to 500 watts plus other Mods. KP6AQ, 949 Havensport Dr., Cincinnati, Ohio. 45240.

HEATH TWOER with 2 xtals-like new. $35. W6-GGT, 1106 Vermont Ave., Boise, Idaho. 83706.

BARGAINS: 2C39A's only $2.50 ea. Unused Silicon PNP Transistors similar to HEP-57 5 for $1.00 postpaid. WANT: Navigator rig. Samkofsky, 201 Eastern Pkwy., Brooklyn, N. Y. 11238.

SELL: Freq. Mtr., BC221, $40. Micro-Match SWR, $15. APR-4, .038 to 1GHz rcvr, $40. K8AGO, 15030 Bradner Rd., Plymouth, Mich. 48170.

FOR SALE: Collins 516F-2, $95. FOB Dallas. W5RKT, 901A Spring Valley Plaza, Richardson, Texas. 75080.

WANTED: Any Power sply from a Mercedes-Benz auto. The unit which is connected by cable to the Becker Radio. WA1BZS, 106 Wallace Row, Wallingford, Conn. 06492.

GONSET II for 6 meters for sale. $65.00. Local only. Joseph Schwartz, 43-34 Union Street, Flushing, N. Y. 11355.

NCX-5, MK II w/NXA ac power and mike. Manuals and original cartons, $375.00. W2HWH, H. Lowenstein, 747 Valley St., 3N, Maplewood, N. J. 07040.

NEIGHBOR PROBLEMS? Send 2 or 3 stamps for supply of reprints on ham radio. Prove hams are not useless nuts. WA1GFJ, 160 Elm, N. Haven, Ct. 06473.

SELL: Knight TR-106 6 mtr. Xcvr & ant. new, $95 or trade for good general coverage rcvr. R. Martinsnaki, W9EOA, Rte. 3, Box 200, La Crosse, Wisconsin. 54601.

READER SERVICE

To obtain literature from advertisers, simply check the box to the name of each advertiser listed below whose product or service is of interest to you.

JUNE, 1971

- ☐ Amidon Associates
- ☐ Amrad Supply
- ☐ Arrow Electronics
- ☐ Barker & Williamson, Inc.
- ☐ Barry Electronics
- ☐ Benton Harbor R&D
- ☐ Clegg, E. T., Associates
- ☐ Cowan Publishing
- ☐ Curtis Electro Devices
- ☐ Datak Corporation
- ☐ Douglas Electronics
- ☐ Drake, R. L. Company
- ☐ Electra Corporation
- ☐ Electronics Illustrated
- ☐ Erickson Communications
- ☐ Fair Radio Sales
- ☐ Goodheart, R. E., Co.
- ☐ Greenlee Tool Co., Division of Greenlee Bros. & Co.
- ☐ Gregory Electronics Corp.
- ☐ H & L Associates
- ☐ Hallicrafters, The, Co.
- ☐ Heath Company
- ☐ Henry Radio Stores
- ☐ Hi-Par Products Company
- ☐ Hy-Gain Electronics Corp.
- ☐ Island Electronics
- ☐ Ithaca Data Service
- ☐ Jan Crystals
- ☐ Juge Electronics, Inc.
- ☐ K-W ndustries, Inc.
- ☐ Kirk
- ☐ Larsen Electronics, Inc.
- ☐ Lee Electronics Labs (LEL)
- ☐ Liberty Electronics
- ☐ Lunar Industries, Inc.
- ☐ Madison Electronics Supply
- ☐ Master Mobile Mounts (Div. of Crystek)
- ☐ Millen, James, Mfg. Co., Inc.
- ☐ Mosley Electronics, Inc.
- ☐ New-Tronics Corporation
- ☐ Palomar Engineers
- ☐ Pennwood Numechron Corp.
- ☐ RCA Electronics Components and Devices
- ☐ Sentry Mfg. Co.
- ☐ Space Electronics
- ☐ Spectronics, Inc.
- ☐ Star-Tronics
- ☐ Swan Electronics
- ☐ Telrex Communication Engineering Laboratories
- ☐ Top-Band Systems
- ☐ Tri-Ex Towers Corp.
- ☐ Unadilla
- ☐ World QSL Bureau
- ☐ World Radio Laboratories

NEW PRODUCTS

84 85 86 87

CQ Reader Service
14 Vanderventer Ave.
Port Washington, N.Y. 11050

Name...Call..................

Street Address..

City..........................State................Zip..............

Advertiser's Index

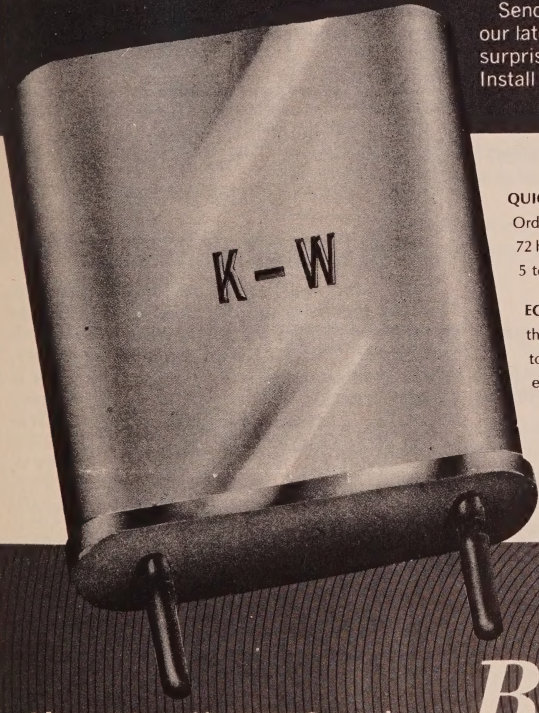
Amidon Associates ... 94
Amrad Supply ... 47
Arrow Electronics ... 67
Barker & Williamson, Inc. ... 92
Barry Electronics ... 88
Benton Harbor R&D ... 94
C. W. Electronics ... 90, 91
Clegg, E. T., Associates ... 34
Cowan Publishing ... 21, 45, 53, 70
Curtis Electro Devices ... 98
Datak Corporation ... 97
Douglas Electronics ... 81
Drake, R. L. Company ... 6, 101, 103
Electra Corporation ... 39
Electronics Illustrated ... 97
Erickson Communications ... 100
Fair Radio Sales ... 88
Gotham ... 112
Goodheart, R. E., Co. ... 86
Greenlee Tool Co., Division of Greenlee Bros. & Co. ... 92
Gregory Electronics Corp. ... 40
H&L Associates ... 88
HAL Devices ... 100
Hallicrafters, The, Co. ... 2
Heath Company ... Cov. II, 1, 27
Henry Radio Stores ... 89, 104, 105
Hi-Par Products Company ... 98
Hy-Gain Electronics Corp. ... 28, 29, 33, 48 54, 55,
Island Electronics ... 88
Ithaca Data Service ... 88
Jan Crystals ... 94
Juge Electronics, Inc. ... 95
K-W Industries, Inc. ... 111
Kirk ... 38
Larsen Electronics, Inc. ... 96
Lee Electronic Labs (LEL) ... 97
Liberty Electronics ... 87
Lunar Industries, Inc. ... 101
Madison Electronics Supply ... 93
Master Mobile Mounts (Div. of Crystek) ... 98
Millen, James, Mfg. Co., Inc. ... 8
Mosley Electronics, Inc. ... 12
New-Tronics Corporation ... 60
Palomar Engineers ... 97
Pennwood Numechron Corp. ... 86, 100
RCA Electronic Components and Devices ... Cov. IV
Sentry Mfg. Co. ... 69
Space Electronics ... 88
Spectronics, Inc. ... 9, 11, 13
Star-Tronics ... 92
Swan Electronics ... 14-21
Telrex Communication Engineering Laboratories ... 4
Top-Band Systems ... 98
Tri-Ex Towers Corp. ... 10
Unadilla ... 103
World QSL Bureau ... 92
World Radio Laboratories ... Cov. III

FREQUENCY STABILITY:
K-W CRYSTALS

The heartbeat of any two-way radio system can best be measured by the quality and dependability of the crystals used in that system. In the designing and maintenance of equipment, we know that selecting reliable crystals is a vital task. K-W Crystals meet that demand. The use of K-W Crystals in two-way components assures total frequency stability . . . a heartbeat that's dependable.

At K-W Industries, the greatest possible degree of accuracy is used in the manufacturing of K-W Crystals and related electronic equipment. We guarantee our crystals indefinitely against defective workmanship and materials. And we offer variety. You'll find models in the K-W line for every requirement. All crystal needs, whether they require standard models or special orders, are filled with the same degree of care.

Send today for additional information and our latest price sheets. You will be pleasantly surprised. Your problems are our business. Install K-W Crystals and be safe.



QUICK DELIVERY . . .All orders are given immediate attention. Orders of 12 crystals or less are on their way to you within 72 hours. Low frequency and special crystals require normally 5 to 7 days.

ECONOMICAL PRICES . . . .Our quantity prices are more than competitive. Please give us the opportunity to prove to you that we can deliver quality-guaranteed crystals at economical prices.

K-W INDUSTRIES INCORPORATED

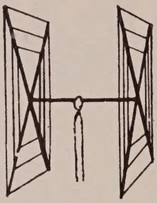
Always Specify K-W Crystals. . . BE SAFE

K-W Industries, Inc. ■ P.O. Box 508 ■ Prague, Oklahoma 74864 ■ Area Code: 405 567-2286

AHA! YOU THOUGHT GOTHAM

made run-of-the-mill ordinary antennas. No, no, no. Our materials are the best, and our design superior. WA1JFG won the New England Round-Up championship with our 3-element 15meter beam by a margin of 5,982 points!

QUADS Worked 42 countries in two weeks with my Gotham Quad and only 75 watts...



W3 CUBICAL QUAD ANTENNAS — these two element beams have a full wavelength driven element and a reflector; the gain is equal to that of a three element beam and the directivity appears to us to be exceptional! ALL METAL (except the insulators) — absolutely no bamboo. Complete with boom, aluminum alloy spreaders; sturdy, universal-type beam mount: uses single 52 ohm coaxial feed; no stubs or matching devices needed; full instruction for the simple one-man assembly and installation are included; this is a fool-proof beam that always works with exceptional results. The cubical quad is the antenna used by the DX champs, and it will do a wonderful job for you!

10/15/20 CUBICAL QUAD SPECIFICATIONS

Antenna Designation: 10/15/20 Quad
Number of Elements: Two. A full wavelength driven element and reflector for each band.
Freq. Covered: 14-14.4 Mc. 21-21.45 Mc. 28-29.7 Mc.
Shipping Weight: 28 lbs. Net Weight: 25 lbs.
Dimensions: About 16′ square.
Power Rating: 5 KW.
Operation Mode: All
SWR: 1.05:1 at resonance
Gain: 8.1 db. over isotropic
F/B Ratio: A minimum of 17 db. F/B
Boom: 10′ long x 1¼″ O.D.: 18 gauge steel; double plated; gold color
Beam Mount: Square aluminum alloy plate incorporating four steel U-bolt assemblies. Will easily support 100 lbs. Universal polarization.
Radiating Elements: Steel wire, tempered and plated, .064″ diameter.
X Frameworks: Each framework consists of two 12′ sections of 1″ OD aluminum 'hi-strength' (Revere) tubing, with telescoping ⅞″ tubing and short section of dowel. Plated hose clamps tighten down on telescoping sections.
Radiator Terminals: Cinch-Jones two-terminal fittings
Feedline (not furnished); 52 ohm coaxial cable

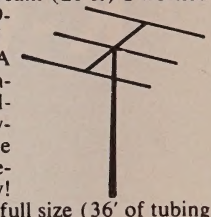
Now check these startling prices—note that they are *much lower* than even the bamboo-type:

10-15-20 CUBICAL QUAD	$37.00
10-15 CUBICAL QUAD	32.00
15-20 CUBICAL QUAD	34.00
TWENTY METER CUBICAL QUAD	27.00
FIFTEEN METER CUBICAL QUAD	26.00
TEN METER CUBICAL QUAD	25.00

(all use single coax feedline)

GOTHAM
1805 Purdy, Dept. CQ,
Miami Beach, Fla. 33139

BEAMS The first morning I put up my 3 element Gotham beam (20 ft) I worked YO4CT, ON5LW, SP9-ADQ, and 4U1ITU THAT ANTENNA WORKS! WN4DYN Compare the performance, value, and price of the following beams and you will see that this offer is unprecedented in radio history!



Each beam is brand new; full size (36′ of tubing for *each* 20 meter element, for instance); absolutely complete including a boom and all hardware; uses a single 52 or 72 ohm coaxial feedline; the SWR is 1:1; easily handles 5 KW; ⅞″ and 1″ alumnium alloy tubing is employed for maximum strength and low wind loading; all beams are adjustable to any frequency in the band.

2 EL 20	$21	4 EL 10	20
3 EL 20	27	7 EL 10	34*
4 EL 20	34*	4 EL 6	20
2 EL 15	17	8 EL 6	30*
3 EL 15	21	12 EL 2	27*
4 EL 15	27*		
5 EL 15	30*		

***20' Boom**

ALL-BAND VERTICALS

"All band vertical!" asked one skeptic. "Twenty meters is murder these days. Let's see you make a contact on twenty meter phone with low power!" So K4KXR switched to twenty, using a V80 antenna and 35 watts AM. Here is a small portion of the stations he worked: VE3FAZ, T12FGS, W5KYJ, W1WOZ, W2-ODH, WA3DJT, WB2FCB, W2YHH, VE3-FOB, WA8CZE, K1SYB, K2RDJ, K1MVV, K8HGY, K3UTL, W8QJC, WA2LVE, YS1-MAM, WA8ATS, K2PGS, W2QJP, W4JWJ, K2PSK, WA8CGA, WB2KWY, W2IWJ, VE3-KT. Moral: It's the antenna that counts! *FLASH!* Switched to 15 c.w. and worked KZ5-IKN, KZ5OWN, HC1LC, PY5ASN, FG7XT, XE2I, KP4AQL, SM5BGK, G2AOB, YV5-CLK. OZ4H. and over a thousand other stations!

V40 vertical for 40, 20, 15, 10, 6 meters	$14.95
V80 vertical for 80, 75, 40, 20, 15, 10, 6 meters	$16.95
V160 vertical for 160, 80, 75, 40, 20, 15, 10, 6 meters	$18.95

"HOW TO ORDER: Send money order (bank, store, or United States) in full. We ship immediately by REA Express, charges collect. DEALERS WRITE."

Don't fiddle Around —

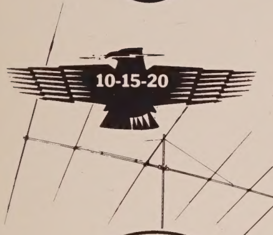
WORLD RADIO

CARRIES THE TERRIFIC

hy-gain ANTENNAS

THAT PUT YOU FIRST IN THE

DX "PILE-UPS"!



10-15-20
$179.95
THDXX
6 elements — 2 kw

OTHER POPULAR HY-GAIN ANTENNAS

TH3MK3	"Standard" 10-15-20 Triband Beam	$144.95
TH3Jr.	"Economy" 10-15-20 Triband Beam	99.95
204BA	20 Meter, 4-Element "DX" Beam	149.95
5BDQ	All-Band (89/10 m) 2 KW Trap Dipole	69.95
Ham-Cat	Complete Hy-Gain Mobile System	102.00
14AVQ	40/10 m Trap Vertical "World's Most Popular"	39.95

- *We'll gladly quote you on your package needs at World's low prices!*

Package Deals with World's Spire Towers

AT WORLD RADIO you choose from TREMENDOUS STOCKS! The Nation's largest stock and variety of Ham Gear!

AT WORLD RADIO you get TOP TRADES on your present gear! World's tremendous volume means you get top dollar on your trade-ins!

ENJOY SPECIAL "PACKAGE PRICES"! Save a bundle on World's Package Buys...selected by people who know Ham equipment best!

FINANCING! Use World's Radio's convenient monthly credit plan or use your BankAmericard or Master Charge when you buy!

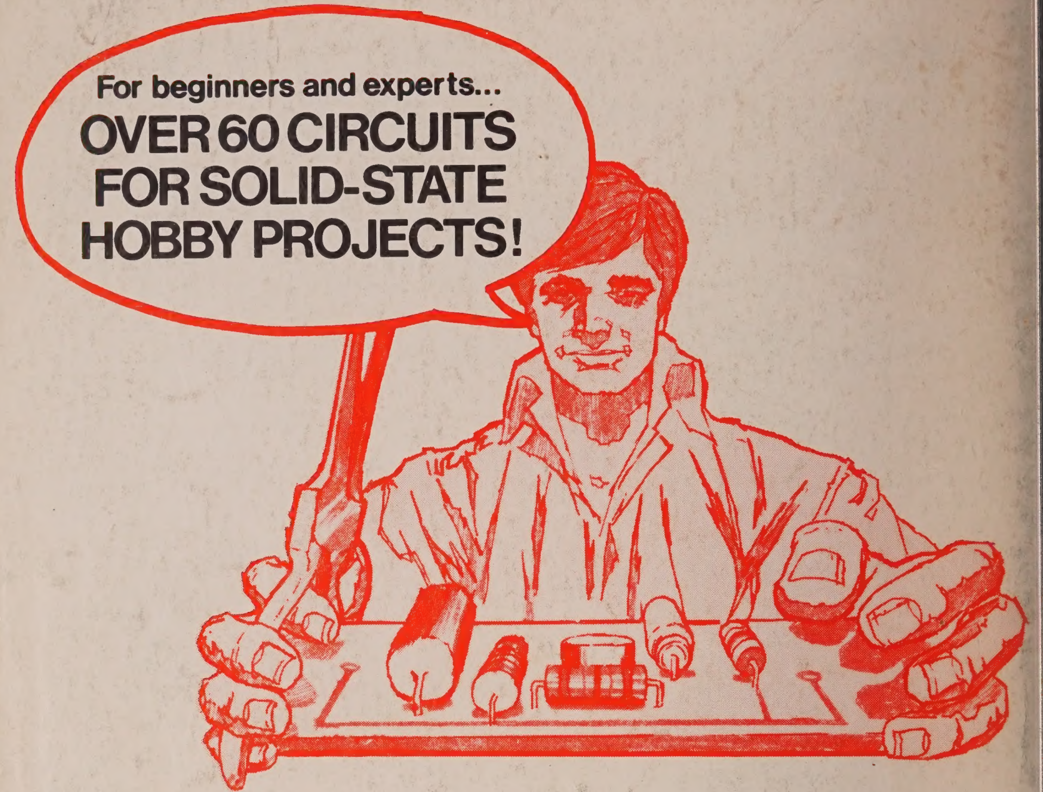
WORLD RADIO
DISCOUNT ELECTRONICS
WORLD RADIO

WORLD RADIO
3415 West Broadway
Council Bluffs, Iowa 51501
Dept. CQ-51

☐ *Please ship me a Hy-Gain ______ Antenna. $ ______ enclosed.*

☐ *Quote me a package deal on a Hy-Gain ______ ______ plus ______*

Name ______
Address ______
City ______ State ______ Zip ______


For beginners and experts...
OVER 60 CIRCUITS FOR SOLID-STATE HOBBY PROJECTS!

Hobbyist? Experimenter? Teacher? The RCA Solid-State HOBBY CIRCUITS MANUAL, HM-91, is for you.

Complete construction information on 62 circuits is given, including detailed descriptions of circuit operation, construction layouts, photographs, schematic diagrams, and parts lists. Full-size drilling or printed-circuit-board templates are included for most circuits.

There are sections on theory and operation of solid-state devices, testing and troubleshooting, basic circuits, mechanical considerations, and suggested circuit uses.

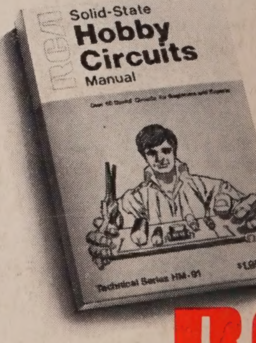
We've included suggestions for hams, motorists, photographers, music and hi-fi buffs, and others.

Build circuits for: Power Supplies . . . Shift Registers . . . Counting Circuits . . . Electronic Clocks . . . Audio Oscillators . . . Microphone Preamplifiers . . . Mixers and Line Amplifiers . . . Phonograph Preamplifier . . . Photoelectric Audio Attenuator . . . IC Wireless Microphone . . . Amplifiers . . . Telegraph Keyers . . . AF Operated Switch . . . Dip/Wave Meter . . . Variable-Frequency Oscillator . . . Calibrators . . . Metronome . . . Fuzz Box . . . Six-Octave Organ . . . Flasher . . . Enlarger Exposure Meter . . . Universal Timer . . . Lamp Dimmer . . . Temperature Alarm . . . Positive-Action Light-Operated Switch . . . Automobile Tachometer . . . Battery Chargers . . . Automobile Light Minder . . . Siren . . . Slot Machine . . . Dice . . . Metal Detector . . . Motor-Speed Control . . . Model Train and Race-Car Speed Control . . . Time Delay.

In addition, RCA has Integrated Circuit Project Kits that contain a complete package of parts for many of these circuits.

The Hobby Circuits Manual is available for only $1.95* from your RCA Distributor; or send check or money order to RCA, Commercial Engineering, Dept. 91/S46, Harrison, N.J. 07029.

*Optional Price



RCA